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Chemical Emergency Preparedness Program Organizing the Community, Gathering Site-Specific Information, Contingency Plan Development, Contingency Plan Appraisal The Criteria, Appendices

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Chemical Emergency Preparedness Program

PB86-155256

Interim Guidance

- Organizing the Community
- Gathering Site-Specific Information
- Contingency Plan Development
- Contingency Plan Appraisal
- The Criteria
- Appendices

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This document, developed by the U.S. Environmental Protection Agency (USEPA) is part of the USEPA National Air Toxics Strategy. The purpose of the document is to provide the public and state and local officials with information to assist them in planning how to respond to accidental releases of acutely toxic chemicals. It provides recommendations on how communities get organized, gather relavent information, and develope, evaluate and update contingency plans. It also describes the criteria used by the EPA to classify chemicals as acutely toxic and provides a list of 402 chemicals that meet these criteria.

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CHEMICAL EMERGENCY PREPAREDNESS PROGRAM
INTERIM GUIDANCE

by

U.S. Environmental Protection Agency

PREFACE

This guidance is intended to help local communities become aware of any acutely toxic chemicals in their area and prepare to respond to any accidental release of such chemicals into the air. Some communities already have response contingency plans; these plans may need to be modified for the case of acutely toxic chemical releases. Other communities may discover that they need to develop a new response contingency plan. This guidance, used in conjunction with FEMA's Planning Guide and Checklist for Hazardous Materials Contingency Plans, will assist communities to adapt existing plans as well as develop a new plan.

The Environmental Protection Agency is publishing here the criteria for identifying acutely toxic chemicals. There is also a list of chemicals which meet EPA's criteria. These are not the only chemicals that could be dangerous to a community, but local communities should give priority to acutely toxic chemicals as they prepare to respond to possible accidental releases.

The goal of the Chemical Emergency Preparedness Program is to assure that communities are prepared to deal effectively with possible accidental releases of acutely toxic chemicals. Developing community awareness and contingency planning are essential parts of the process of becoming prepared.

There are three stages in developing community awareness and preparedness. The first stage involves identifying a leader and naming a work group that is representative of various segments of the community. This work group will be responsible for learning what acutely toxic chemicals are present in the community and how well prepared the community already is for responding to a possible accident. Gathering and analyzing this site-specific information is the second stage in developing community preparedness and response capability. The third stage is preparing or adapting a response contingency plan. This guidance suggests the various elements which should be part of such a contingency plan.

This guidance does not provide a simple recipe that local communities can use to write a contingency plan quickly and for all time. Rather, communities that use this guidance should be able to develop the ability continually to be aware of any acutely toxic chemicals in their midst and to be prepared to respond to accidental releases of those chemicals.

Portions of this guidance document have received extensive review by parties outside EPA. In order to assure that all portions of the document are available to all interested parties for review and comment, EPA is publishing this as **interim** guidance. There may be some States and communities who wish to make immediate use of this interim guidance to begin the process of preparedness and contingency planning for the accidental release of these chemicals into the air. Technical assistance and training in contingency planning and use of the criteria and list will also be available to the states from Federal agencies.

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1. INTRODUCTION

1.1 BACKGROUND

The tragedy in Bhopal, India, has made people in the United States aware of the possibility of serious chemical accidents and the need for local communities to have in place an effective program to deal with chemicals that can cause death or serious injury if an accidental release occurs. On June 4, 1985, the Administrator of the U.S. Environmental Protection Agency (EPA) announced a two-part National Strategy for Toxic Air Pollutants, one part of which was to provide the public and State and local officials with information to assist them in planning to respond to accidental releases of acutely toxic chemicals. EPA has already established the second, and larger, part of this strategy under Section 112 of the Clean Air Act, designed to deal with routine releases of hazardous air pollutants.

EPA has developed criteria to identify acutely toxic chemicals, and a list of such chemicals. These acutely toxic chemicals can cause death or injury in the event of an accidental release into the air. The extent of harm will depend on the chemical involved, its physical state, how it is handled at the site,[1] the amount released, the prevailing weather conditions at the time of the release, the population potentially affected, the emergency preparedness measures in place in the community, and the actual response actions taken.

Major accidents involving releases of acutely toxic chemicals are infrequent; those that cause fatalities and serious injury to the general public are very infrequent. A community should not be unduly alarmed if it finds, within its boundaries, chemicals which meet the criteria. Rather, a community should view this information as a way to identify and rank potential risks and to review, improve, and build upon existing contingency plans to address the potential risks in a way that is realistic and meaningful for the community.

The focus of the selection criteria, the accompanying list of acutely toxic chemicals, and this guidance is on helping communities prepare to respond to serious chemical accidents, not on all chemically related dangers. Nevertheless, EPA urges local communities to develop overall contingency plans for response to any emergency. If a community discovers that it has a relatively low potential for a catastrophic accident, that community should still address the possibility of less severe accidents.

1.2 PURPOSES OF THIS GUIDANCE

EPA is publishing this guidance to accompany its criteria and list. The purposes of this set of materials are to:

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[1] For purposes of this guidance, "site" or "facility" means any location where acutely toxic chemicals are manufactured, processed, stored, handled, used, or disposed; in short, any place where these chemicals may be found. Communities should be aware that chemicals are frequently found at places other than industrial sites.

- Serve as a catalyst for bringing people in a community together to focus on emergency response and preparedness;
- Provide communities with information useful to them in getting organized to carry out the task;
- Provide the methods for gathering data as a tool for analyzing the extent of the problem in the local area;
- Encourage facilities to make public certain information about hazardous substances they manufacture, process, store, handle, use, or transport; and
- Provide information on the development of contingency plans for communities without such a plan and serve as a method of reviewing existing plans in other communities.

This guidance is meant to enhance community preparedness and response capability. The development of community awareness and a contingency plan are only means to achieving these ends. Communities should recognize that developing community awareness and a contingency plan are part of the process of becoming better prepared to respond to an incident.

This guidance is only for that part of EPA's National Strategy for Toxic Air Pollutants that addresses the accidental release of acutely toxic chemicals. The design and intended use of this material distinguish it from EPA's regulatory activities for toxic air pollutants under Section 112 of the Clean Air Act. In particular, the substances on the acutely toxic chemicals list meet specific toxicity criteria only, while regulatory decisions under Section 112 consider both toxicity and exposure criteria. Further, actions taken under Section 112 consider a broader range of toxicity criteria; specifically, long-term health effects such as cancer. These differences in design and intent between the list presented here and the list of chemicals regulated under Section 112 mean that substances appearing on one list will not necessarily appear on the other list, although some overlap between the two lists is to be expected.

1.3 RELATED PROGRAMS AND MATERIALS

For many years, a number of Federal agencies have engaged in activities intended to reduce the risks associated with hazardous materials. These activities include, among others, major programs conducted by the Department of Transportation (DOT), the United States Coast Guard, the Occupational Safety and Health Administration (OSHA), the Federal Emergency Management Agency (FEMA), and the Nuclear Regularly Commission. Many related responsibilities are borne by EPA, through its mandates under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA or "Superfund"), the Resource Conservation and Recovery Act (RCRA), the Toxic Substances Control Act (TSCA), the Clean Air Act, and the Clean Water Act, which are concerned with hazardous substances, hazardous wastes, toxic substances, air pollution, and water pollution, respectively. Additionally, the National Oil and Hazardous Substances Contingency Plan (NCP) provides organizational guidance for Federal responses to hazardous material releases (see 40 CFR Part 300), designating Federal On-Scene Coordinators

(OSCs) from EPA, the U.S. Coast Guard, and the Department of Defense, depending on the location of the incident. Thus, the National Strategy for Toxic Air Pollutants represents only one part of a long and comprehensive effort by EPA and other Federal agencies to improve the environmental safety of the nation.

Many communities already have contingency plans. Existing plans can be amended to include the particular case of acutely toxic chemicals. This guidance can help a community identify what must be added to its comprehensive contingency plan to make it more complete. Communities that have several facilities may discover that separate contingency plans already exist at each site. In such cases, planners should work to integrate these individual plans so that any necessary response will be coordinated and orderly.

The language and format of Chapters 4 and 5 of this guidance have been deliberately chosen to correspond with the language and format of Planning Guide and Checklist for Hazardous Materials Contingency Plans (Washington, D.C.: Federal Emergency Management Agency and U.S. Environmental Protection Agency, 1981). Popularly known as FEMA-10, this guide is now under joint revision by FEMA and EPA. The revised document will include materials contained here and will ultimately replace Chapters 4 and 5 of this guidance, which are being issued on an interim basis. Planners using this guidance should also consult FEMA-10 for additional assistance in contingency planning.

EPA is developing training programs to complement this Chemical Emergency Preparedness Program Guidance. Communities seeking help in developing preparedness and response programs should consult appropriate State agencies. States may consult with EPA Regional offices for additional EPA training and assistance (see Appendix G).

The U.S. Department of Transportation (DOT) has addressed contingency planning for transportation accidents. Appendix E includes a brief description of DOT's Community Teamwork: Working Together to Promote Hazardous Materials Transportation Safety. Communities which face severe budget constraints will benefit from the many cost-saving suggestions found in DOT's Community Teamwork volume.

DOT has also sponsored a number of demonstration projects for hazardous materials transportation contingency planning. A summary of the experiences and lessons learned from these demonstration projects can be found in Appendix F.

1.4 COOPERATION IN PLANNING

This guidance emphasizes that planning is a community project. Successful planning will require the cooperation of all interested parties. In some cases, the planning process will cross jurisdictional lines into other cities and counties. Everyone involved must cooperate in order to facilitate the planning process and to ensure effective response at the time of an emergency. Cooperation is a key factor in the process of improving a community's preparedness and response capabilities.

Special attention should be given to cooperation with the chemical industry and other handlers of acutely toxic chemicals. Whenever "community" is referred to in this document, it is presumed that local facilities are an integral part of that community. Site representatives should be part of the planning process. In fact, much of the needed information for planning, as well as resources for emergency response, will be found in local facilities.

1.5 STRUCTURE OF THIS GUIDANCE

Chapter 2 provides recommendations on how communities can **organize** to develop community awareness and contingency planning programs to address the risks associated with acutely toxic chemicals. Chapter 3 provides general guidelines on **gathering information** from local facilities and government to determine whether there are acutely toxic chemicals in the community, whether they pose potentially significant risks to public health and safety, what measures facilities have taken to control releases, and the emergency response resources and capabilities available both at facilities and in the community. Chapter 4 provides guidance on ways to use the information gathered to **develop community contingency plans** which specifically address releases into the air of acutely toxic chemicals. Chapter 5 is a brief description of methods for **evaluating and regularly updating** a contingency plan. Chapter 6 describes the **criteria** used for determining what substances are classified as acutely toxic chemicals.

There are seven appendices to this guidance. Appendix A is the list of acutely toxic chemicals. Appendix B contains definitions of technical terms relating to acutely toxic chemicals. Appendix C explains the acronyms that appear in the text. Appendix D describes the "Quantity Determination Method" that will help a community assess the potential hazard posed by acutely toxic chemicals within its boundaries. A selected bibliography is provided in Appendix E. Appendix F contains a summary of the lessons learned from DOT's demonstration projects for transportation safety contingency planning. Finally, Appendix G lists EPA's regional offices and preparedness contacts for the Chemical Emergency Preparedness Program.

2. ORGANIZING THE COMMUNITY

2.1 GENERAL CONSIDERATIONS

In organizing a community to develop an awareness and preparedness program, it is useful to discuss some general considerations concerning the various parties in the community directly concerned with the hazards posed by acutely toxic chemicals, the role of local government in addressing such hazards, and the relationship with preparedness planning at the regional and State levels. This discussion leads to several general conclusions and recommendations concerning the basics of organizing.

2.1.1 Including Interested Parties

When acutely toxic chemicals are present in an area, there are many individuals with the common goal of assuring that adequate resources and plans are in place to respond to accidental releases. These individuals include, among others:

- People living or working near facilities and transportation routes with acutely toxic chemicals who could be endangered in case of an incident;
- The owners, managers, workers, and labor organizations of the facilities and transportation systems;
- Officials of the legislative and executive branches of government who are responsible for establishing, financing, and implementing accident prevention, response, and environmental programs;
- Local citizens with environmental and public health concerns; and
- Employees and officials of the organizations that perform the actual response work associated with acutely toxic chemicals, such as firefighters, police, and health personnel.

While all the individuals noted above have a common interest in reducing the risks posed by acutely toxic chemicals, their differing economic, political, and social perspectives may cause them to favor different means for promoting safety. For example, people who live near a facility with such chemicals are likely to be greatly concerned about avoiding any threat to their lives, and are likely to care less about the costs of developing accident prevention and response measures than some of the other groups involved. Others in the community are likely to be more sensitive to the costs involved, and may be anxious to avoid expenditures for unnecessarily elaborate prevention and response measures.

There may also be differing views among the agencies and organizations with emergency response functions about the roles they should play in case of an incident. The local fire department, police department, civil defense agency, environmental protection agency, and public health agency are all likely to have some responsibilities in responding to an incident. However, each of these organizations might envision a very different set of responsibilities for their respective agencies for planning or for management on scene.

In organizing the community to address the problems associated with acutely toxic chemicals, it is important to bear in mind that **all affected parties have a legitimate interest in the choices among alternative means.** Therefore, strong efforts should be made to assure that all groups with an interest in the planning process are included.

Some interest groups in the community have well-defined political identities and representation, but others may not. Government agencies, private industry, and trade unions at the facilities are all likely to have ready institutional access to a contingency planning process. Nearby residents, however, may lack an effective vehicle for institutional representation. Organizations that may be available to represent the residents' interests include neighborhood associations, church organizations, environmental groups, or *ad hoc* organizations formed especially to deal with the threats posed by the presence of acutely toxic chemicals in a neighborhood.

2.1.2 Special Role of Local Government

For several reasons, local governments have a special role to play in the development of community awareness and emergency preparedness programs. First, local governments bear major responsibilities for protecting public health and safety by preventing and responding to accidents; local fire departments, for example, generally have the lead responsibility for responding to incidents involving acutely toxic chemicals. Second, one of the principal functions of local government is to mediate and resolve the sometimes competing ideas of different interest groups. Finally, local governments generally have the fiscal and legislative authority to raise funds for equipment and personnel required for emergency response.

2.1.3 Relationship with State and Regional Planning Efforts

Local contingency plans must give consideration to coordination with other jurisdictions with whom it would be necessary to cooperate in responding to a multi-jurisdictional incident. Because incidents stemming from the release of acutely toxic chemicals are not constrained by jurisdictional borders, multi-jurisdictional contingency planning at the State or regional level is a useful complement to local planning efforts. In some cases, international planning may be needed. Even if several groups have prepared good contingency response plans, there could be confusion during an emergency if the various plans are not carefully coordinated. And even if an incident is unlikely to cross political boundaries, regional planning can provide several benefits. By planning together, local jurisdictions may avoid the unnecessary purchase of duplicative equipment and, by purchasing equipment or by training personnel jointly, communities may be able to save money. Regional contingency planning efforts can also provide a useful forum for local jurisdictions to discuss common problems in a neutral political arena, for example, under the auspices of a regional council of governments. The charter of such a regional council could indicate how disputes are to be resolved.

Because regional organizations generally lack fiscal and administrative authority for implementing emergency response plans, regional contingency planning efforts often cannot serve adequately as substitutes for local planning. Thus, in deciding to participate in planning at the regional level, communities should recognize that complementary local planning efforts will often still be required.

Communities should work with their State governments before beginning and throughout the development of a preparedness program.

2.1.4 General Recommendations

Here are some conclusions and recommendations that will help the planning effort:

- All local political jurisdictions with emergency response authority should take steps to conduct a community awareness and preparedness program and provide for its leadership if the chemicals are found within its boundaries. **It is recommended that such steps be initiated by the jurisdiction's chief executive official (e.g., mayor, city manager, county executive).** If a chief executive does not assume this responsibility, other interested parties should initiate action. They should recognize, however, that successful implementation of preparedness plans requires the cooperation and approval of local government. If more than one political jurisdiction has emergency response authority for a single area, it is essential that their chief executives should coordinate the planning process.

- Particular efforts must be taken to achieve understanding and cooperation among parties involved, because of the differing perspectives of groups within the community strongly concerned about the potential hazards of acutely toxic chemicals. **It is recommended that overall responsibility for developing a community awareness and preparedness program for acutely toxic chemicals be assigned to a "work group" comprised of representatives from each element of the community with a substantial interest.** If a community chooses not to assign the responsibility to such a work group, it should recognize that the ultimate public acceptance of the program will require some appropriate consensus-building process involving broad-based participation throughout the process by concerned interest groups.

2.2 ORGANIZING THE COMMUNITY -- THE SPECIFIC STEPS

It is recommended that the following specific steps be taken in organizing a community to develop an awareness and preparedness program for acutely toxic chemicals, with the first three items accomplished in whatever order is best suited for local circumstances:

- Take stock of related preparedness efforts and organizations (including advisory councils);
- Select a leader;
- Form a work group;
- Assign responsibility for specific preparedness planning tasks, including specific completion dates;
- Establish procedures for monitoring and approving results of planning assignments; and
- Establish procedures for validation and implementation of approved plans.

2.2.1 Taking Stock of Related Preparedness Efforts and Organizations

Before undertaking any other work, steps should be taken to search out all existing contingency plans. To the extent possible, currently used plans should be amended to account for the special problems posed by acutely toxic chemicals, thereby avoiding redundant contingency plans. Even plans that are no longer used may provide a useful starting point. More general plans can also be a source of useful information and ideas. In seeking to identify existing plans, it will be helpful to consult organizations such as:

- State and local emergency management offices;
- State and local air pollution and environmental agencies;
- State and local transportation agencies;
- State and local public health agencies;
- Fire departments;
- State and local public service agencies, such as the Red Cross;
- Local industry and industrial associations; and
- Regional offices of Federal agencies such as EPA and FEMA.

In addition to the above organizations, communities should coordinate their activities with those of the Federal agencies as outlined in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The NCP establishes an organizational structure for Federal responses to hazardous materials releases that include the National Response Team (NRT), 12 Regional Response Teams (RRTs), and predesignated Federal On-Scene Coordinators (OSCs). The NRT, composed of 12 Federal agencies with major environmental and public health responsibilities, carries out national planning and coordination for responding to oil and hazardous substance emergencies. The regional counterparts to the NRT are the 12 RRTs. There is an RRT, made up of regional representatives of the NRT agencies as well as representatives of each State, for each Federal region and for Alaska and the Caribbean Islands. These RRTs serve as planning and preparedness bodies before a response, and can provide advice and assistance during a response. Each RRT maintains a Federal Regional Contingency Plan designed to provide for coordination of a timely, effective response by Federal agencies and other organizations to an oil discharge or hazardous substance release.

Communities can contact or obtain information on the OSC and RRT covering their area through the EPA Regional Preparedness Contact; see Appendix G for a list of these contacts.

2.2.2 Selecting a Leader

The person initiating the contingency planning process may elect to appoint a leader for the effort, or he may appoint a work group and have the group decide who will lead the effort. Either approach can be used, and the chief executive (or whoever initiates the process) should determine which course is best suited to local circumstances. Regardless of how the leader is selected, it is his or her role to oversee the work group's efforts through the entire planning process.

Four factors are of major importance in selecting a leader:

- The person's existing responsibilities related to emergency planning, prevention, and response;
- The degree of respect held for the person by groups with an interest in acutely toxic chemicals;
- The person's history of working relationships with concerned community agencies and organizations; and
- The person's ability to get the job done.

Logical sources for a leader include:

- **The Chief Executive or other elected official.** Leadership by a mayor, city or county council member, or other senior official is likely to contribute substantially to public confidence, encourage commitment of time and resources by other key parties, and expedite the implementation of program initiatives.
- **A public safety department.** In most communities, the fire department or police department bears principal responsibility for responding to incidents involving chemical releases and, typically, for inspecting facilities as well.

- **The emergency management or civil defense agency.** In many communities, officials of such an agency will be knowledgeable and experienced in planning for major disasters from a variety of causes.
- **The local environmental agency (particularly any air pollution control agency) or public health agency.** Persons with expertise in these areas will have special knowledge about the risks posed by acutely toxic chemicals.
- **A planning agency.** Officials in a planning agency will be familiar with the general planning process and with the activities and resources of the community.
- **Others.** Communities should be creative and consider other possible sources for a leader, such as civic groups, volunteer organizations, and agencies not mentioned above.

Personal considerations as well as institutional ones should be weighed in selecting a leader. For example, a particular community's fire chief may appear to have all the right resources for addressing the hazards of acutely toxic chemicals. But if that individual does not get along with, say, police or other local officials, it would be best to look for a different leader.

2.2.3 Forming a Work Group

In selecting the members of a work group that will bear overall responsibility for developing a community awareness and preparedness program for acutely toxic chemicals, four considerations are most important:

- The group must possess, or have ready access to, a wide range of expertise relating to the community, the design and operation of chemical facilities and transportation systems, and the mechanics of emergency response and response planning;
- The members of the group must agree on their purpose and be able to work cooperatively with one another;
- The members of the group must have the authority and resources to get the job done; and
- The group must be representative of all elements of the community with a substantial interest in reducing the risks posed by acutely toxic chemicals.

A comprehensive list of parties who should be considered for participation in the work group (adapted from FEMA-10) is presented in Exhibit 2-1. Because of the particular nature of the hazards of acutely toxic chemicals, the members selected primarily for technical expertise should include chemists, chemical engineers, industrial hygienists, and systems safety engineers.

EXHIBIT 2-1

SUGGESTIONS FOR THE WORKING GROUP

Mayor or Representative

City Manager

County Executive or Representative

Chair (or representative), Board of Supervisors

Fire Department

Police Department

Emergency Management or Civil Defense Agency

Environmental Agency (e.g., Air Pollution Control Agency)

Health Department, Hospitals, and Medical Community

Major Industry Representatives

Labor Union Representatives (e.g., chemical and transportation)

Representatives from Volunteer Organizations (e.g., Red Cross)

Public Interest and Citizens Groups and representatives of affected neighborhoods

Public Works (e.g., Waste Disposal, Water, Sanitation, and Roads)

Schools

Key Representatives from Bordering Cities and Counties

State Representatives

Planning Department

News Media Representative (local newspaper, radio, television)

Other Agencies (e.g., Welfare, Parks, and Utilities)

Other Technical Experts (e.g., Chemists and Chemical Engineers)

Note: Adapted from Planning Guide and Checklist for Hazardous Materials Contingency Plans. Washington, D.C.: Federal Emergency Management Agency and U.S. Environmental Protection Agency, 1981.

For the work group to function effectively in an oversight capacity, its size should be limited to no more than about 10 to 15 members. In communities with many interested parties, it will be necessary to select from among them carefully so as to assure fair and comprehensive representation. Some individuals may feel left out of the planning process. This can be offset by providing these individuals access to the planning process through the various approaches noted in the following sections, such as membership on a task force or advisory council.

2.2.4 Assigning Responsibility for Specific Preparedness Planning Tasks

The major tasks involved in preparedness planning for acutely hazardous chemicals are:

- **Hazard identification and analysis**, which consists of identifying facilities and transportation routes with acutely toxic chemicals and determining the associated hazards posed to the community;
- **Capability assessment, the evaluation of existing prevention and response capabilities**, which includes an inventory of existing prevention measures, response capabilities and plans, and an assessment of their adequacy; and
- **Preparation of a contingency plan** that describes the personnel, equipment, and procedures to be used in case of accidental release of an acutely toxic chemical.

These tasks are not simple and are discussed in detail in Chapters 3 and 4. Exhibit 2-2 outlines the essential components of the tasks, the expertise needed, and some possible sources of this expertise within the community.

There are three basic staffing approaches that may be employed to accomplish the tasks involved in preparedness planning:

- **Assign staff**. Previous experience in related planning efforts demonstrates the usefulness of assigning one or more dedicated staff members to coordinate the planning process and perform specific planning tasks. The staff may be assigned within a "lead agency" having related responsibilities and/or expertise, or may be created separately through outside hiring and/or staff loans from government agencies or industry.
- **Assign task forces or committees**. Planning tasks can be performed by task forces or committees composed entirely or in part of members of the work group. Adding knowledgeable representatives of government agencies, industry, environmental, labor, and other community organizations to the individual task forces or committees not only supplements the work group's expertise and resources, but also provides an

EXHBIT 2-2

SUMMARY OF TASKS INVOLVED IN PREPAREDNESS PLANNING FOR ACUTELY TOXIC CHEMICALS

Activity	Components	Expertise Required	Possible Sources of Expertise
Hazard identification and analysis	o Identify facilities and transportation routes that have acutely toxic chemicals o Determine which acutely toxic chemicals are present and in what quantities o Identify the population and business makeup of areas surrounding the facilities o Estimate the degree of hazard to the community	o Familiarity with the chemical industry, chemical processes, and plant engineering o Familiarity with the geography and demography of the community o Familiarity with hazard analysis methodology	o Fire and police departments o Local industry o Universities o Federal Regional Response Team o Consultants o Environmental agencies (e.g., air pollution control agencies) o Red Cross o Volunteers
Capability assessment	o Determine the prevention and response personnel and equipment used by industry o Determine the prevention and response personnel and equipment available from government and other sources o Assess the adequacy of available personnel and equipment	o Familiarity with the chemical industry, chemical processes, and plant safety practices and standards o Familiarity with emergency response and contingency planning practices and standards o Knowledge of police, fire, and emergency medical procedures	o Fire, police, and health departments o Emergency management and civil defense agencies o Local industry o Universities o Environmental groups o Hospitals o Consultants o Environmental agencies (e.g., air pollution control agencies) o Red Cross
Preparation of the contingency plan	o Assemble and evaluate existing plans o Analyze the requirements for a new or revised plan dealing with acutely toxic chemicals o Prepare plans denoting personnel and equipment to be used, procedures to be followed, and responsibilities of responders	o Familiarity with contingency planning practices o Familiarity with capabilities and operating practices of response groups o Understanding of the mechanics of obtaining plan approval	o Fire and police departments o Emergency preparedness and civil defense agencies o Planning agencies o Universities o Local industry o Environmental agencies (e.g., air pollution control agencies) o Red Cross

opportunity for additional interested parties to participate directly in the process.

- **Hire contractors or consultants.** If the personnel resources available for the formation of a dedicated staff and task forces or committees are limited, and funds can be provided, the work group may elect to hire contractors or consultants. Work assigned to a contractor can range from a specialized job, such as designing a survey, to performing an entire planning task (e.g., hazard identification and analysis).

The three approaches presented above are not mutually exclusive. A community may adopt any combination of the approaches that best matches local circumstances and resources.

2.2.5 Establishing Procedures for Monitoring and Approving the Planning Tasks

The monitoring and approval of planning assignments are the central responsibilities of the work group. In discharging these responsibilities, **it is recommended that the work group operate on a consensus basis.** Achieving consensus takes more time than majority voting, but it is the best way to assure that all represented parties have an opportunity to express their views and that the decisions made balance competing interests. If it is determined that a consensus method is inappropriate or impossible (e.g., because of the multi-jurisdictional nature of a group), the work group should formally decide how issues will be resolved.

On critical decisions, it may be desirable to extend the scope of participation beyond the membership of the work group. Approaches that can be used to encourage community consensus building through broadened participation in the process include:

- **Community workshops** with short presentations by work group members followed by a question-and-answer period;
- **Publication of notice "for comment"** in local newspapers, that offers interested individuals and groups an opportunity to express their views in writing;
- **Public meetings** where citizens can submit oral and written comments;
- **Invited reviews** by key interest groups, that can provide an opportunity for direct participation if all such groups cannot be represented on the work group; and
- **Advisory councils,** composed of a relatively large number of interested parties, that can independently review and comment on the work group's efforts.

The procedures to be used for monitoring and approving the planning assignments should be carefully thought out at the beginning of the program; planning efforts work best when people understand the ground rules and know when and how they will be able to participate. Of course, the monitoring and approval process can be adjusted at any time to accommodate variations in citizen interest.

2.2.6 Establishing Procedures and Assigning Responsibility for Validating and Implementing the Approved Contingency Plans

After the planning process has been completed, plans must be validated and implemented. The personnel and equipment required must be available, and procedures that were agreed upon must be tested and implemented. To test the adequacy of the plans, first tabletop and then field simulation exercises should be conducted; it is far better to detect a flaw in a plan in a simulation than during the response to an actual incident. In addition, it will be necessary to update the hazard and capabilities assessments periodically to assure that the plans are kept current. "Contingency Plan Appraisal and Continuing Planning" is discussed in Chapter 5.

3. GATHERING AND ANALYZING SITE-SPECIFIC INFORMATION

3.1 PURPOSE

This chapter provides examples of questions intended to assist community work groups in gathering information to use in developing a contingency plan for the accidental release of acutely toxic chemicals. The community work group will need to gather information about ongoing measures facilities have taken to control potential releases, the available response resources and capabilities, and existing contingency plans. The request for information should be an opening for continuing dialog within the community. The information should be sought in such a way that facilities are encouraged to cooperate and participate actively in the planning process along with local government and other community groups. Once the dialog is established, the community can learn what the facility is doing and what measures have been put in place to reduce risks, and also identify what additional resources such as personnel, training, and equipment might be needed in the community.

Some of the needed information may already be assembled as a result of previous government efforts or cooperative programs such as the Chemical Manufacturers Association (CMA) Community Awareness and Emergency Response (CAER) program. For example, some State and local governments have adopted community right-to-know legislation. These community right-to-know provisions vary, but they generally require industry and other handlers of hazardous materials to provide information to State or local authorities and/or the public about hazardous materials in the community. CMA's CAER program is totally voluntary and is in the preliminary stages of implementation. The CAER program urges chemical plant managers to develop a community outreach program and to provide the public with information on chemicals manufactured or used within the plant. The major objective of the CAER program is to improve local emergency response planning by combining chemical plant emergency plans with other local planning to achieve an integrated community emergency response plan. The work group should ask the local sites if they are participating in the CAER program; this may stimulate non-CMA members to use the CAER approach. If a facility is participating in the CAER program, the emergency response plans developed by the facility will serve as a good starting point in information gathering and contingency planning.

The questions presented in this chapter are examples of the types of information-gathering questions a community may want to use in developing a contingency plan. These questions should generate a logical flow of additional questions. For example, one question asks whether any acutely toxic chemicals are handled or stored near other chemicals that are flammable, explosive, or reactive. If the answer is yes, subsequent questions could be designed to: (1) identify these chemicals, and (2) determine how the facility protects the chemical of concern (e.g., the chemical of concern is stored in fire-proof containers, or the adjacent flammable, explosive, or reactive chemical is stored under conditions to prevent leakage or explosion). A community work group may use some, all, or none of the questions in this document. Depending on the community's initial perception of potential risks, the questions can be tailored by the work group to meet specific local needs.

Work group members should always be aware that:

- The information-gathering effort should not be adversarial but rather a real attempt to cooperate in solving a potential problem facing the entire community;
- Facilities may be sensitive concerning what they consider proprietary business information; and
- Asking a particular question does not imply that there is a problem but rather it shows a desire to identify and address potential problems.

3.2 ORGANIZATION AND USE OF THE GUIDANCE

The guidance for gathering and analyzing site-specific information is presented in four sections, relating, in turn, to a community's need to identify:

- Which sites in the community are preliminary candidates to be evaluated for contingency planning (Section A);
- What is being done with acutely toxic chemicals at a site and whether it presents a potential problem (Section B);
- What measures and controls a site has in place to control accidental releases of acutely toxic chemicals to the air (Section C); and
- What response resources and capabilities exist both at the site and in the community (Section D).

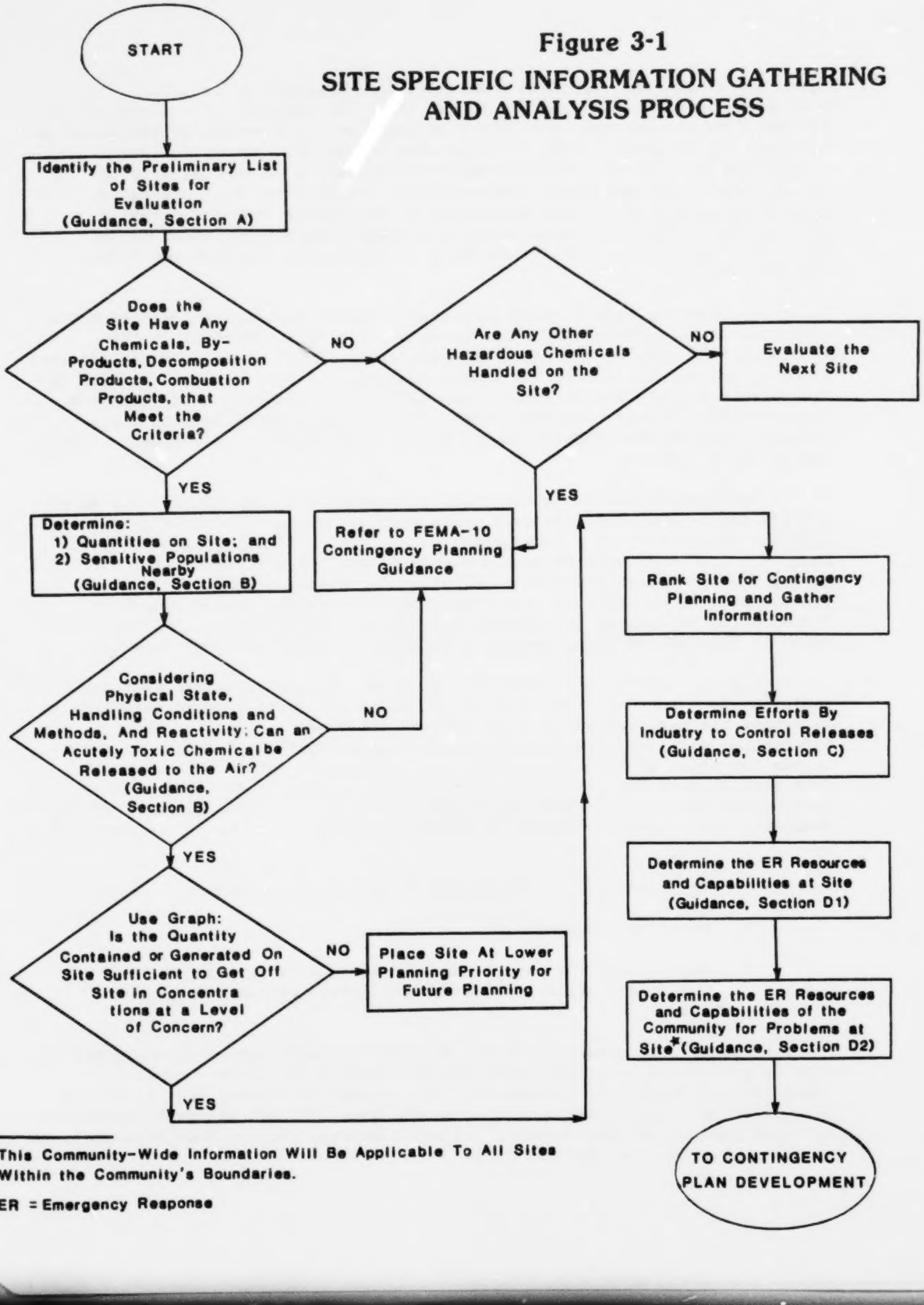
Figure 3-1 shows the general steps a work group can follow in using site-specific information to guide and support its contingency planning efforts.

Section A, Preliminary Site Identification, discusses the development of a preliminary list of candidate sites in the community to be further evaluated for contingency planning.

Section B, Analysis of Site Specific Activities Involving Acutely Toxic Chemicals, discusses the method of conducting an analysis to assess the potential hazard to the community posed by local activities involving acutely toxic chemicals. Section B poses example questions that the community work group can ask sites identified in Section A to develop an information base for the necessary assessment.

As the community work group builds this information base, it may identify a need to establish priorities among multiple sites and/or chemicals so that the task of assessing the risk from individual sites and the need for an emergency response plan can proceed in a manageable fashion. The tool, developed by EPA, to prioritize sites is based upon an estimation of the

Figure 3-1
SITE SPECIFIC INFORMATION GATHERING AND ANALYSIS PROCESS


START
Identify the Preliminary List of Sites for Evaluation (Guidance, Section A)
Does the Site Have Any Chemicals, By-Products, Decomposition Products, Combustion Products, that Meet the Criteria?
NO
Are Any Other Hazardous Chemicals Handled on the Site?
NO
Evaluate the Next Site
YES
YES
Determine: 1) Quantities on Site; and 2) Sensitive Populations Nearby (Guidance, Section B)
Refer to FEMA-10 Contingency Planning Guidance
Considering Physical State, Handling Conditions and Methods, And Reactivity; Can an Acutely Toxic Chemical be Released to the Air? (Guidance, Section B)
NO
YES
Use Graph: Is the Quantity Contained or Generated On Site Sufficient to Get Off Site in Concentrations at a Level of Concern?
NO
Place Site At Lower Planning Priority for Future Planning
YES
Rank Site for Contingency Planning and Gather Information
Determine Efforts By Industry to Control Releases (Guidance, Section C)
Determine the ER Resources and Capabilities at Site (Guidance, Section D1)
Determine the ER Resources and Capabilities of the Community for Problems at Site* (Guidance, Section D2)
TO CONTINGENCY PLAN DEVELOPMENT

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* This Community-Wide Information Will Be Applicable To All Sites Within the Community's Boundaries.

ER = Emergency Response

"quantity of concern" for each chemical. (See Appendix D for a full discussion of the method and how to use it.) The quantity of concern is derived from an exposure level which is based on the Immediately Dangerous to Life and Health level (IDLH). In addition to specific activities associated with a chemical, sites handling quantities in excess of the quantity of concern should be considered high priority. Those sites with quantities less than the quantity of concern should not be eliminated from the planning process, but rather should be assigned a lower priority depending on the activities on a site. For further help in conducting a hazard analysis, consult FEMA-10.

Some sites may have already conducted a hazard analysis to determine the potential of an accidental release of an acutely toxic chemical in the community. If this is the case, the work group should review the methodology, results, and conclusions of the hazard analysis. The work group can then use the Section B questions in discussions with site representatives to assure that relevant factors were considered. If the group determines that the relevant factors were considered, it may proceed directly to the next steps in the planning process.

In addition to assessing the risks associated with facilities that handle acutely toxic chemicals, the work group should consider the risks associated with the possibility of a transportation accident. Identifying acutely toxic chemicals that only pass through a community will be extremely difficult. The work group may obtain assistance in collecting useful information from representatives of trucking, rail, and barge industries in the community. Guidance for evaluating the hazards associated with transportation may be found in FEMA-10 and DOT's Community Teamwork document (see Appendix E).

Section C, Site Control Measures, provides example questions that the community work group can ask at sites which handle acutely toxic chemicals to determine the measures employed to control accidental releases. This information will increase community awareness of what the site is doing to lessen the risks of handling acutely toxic chemicals within the community. This area is very sensitive and, if not properly addressed, can create a destructive adversarial relationship between sites and other elements of the community. All parties involved must be sensitive to issues of concern such as:

- The disclosure of proprietary business information;
- Security concerns; and
- The community's need to know what the site is doing that could affect the health and safety of community members.

The appropriate questions to ask at each site will depend upon whether the site is processing, storing, using and/or transporting acutely toxic chemicals. Different facilities will vary widely in process conditions and configuration, layout, and control measures used. To ask the right questions and make good use of the answers, trained technical persons should be included on the work group (see Exhibit 2-1).

Section D, Response Capabilities, provides example questions relating to the response capabilities and resources of both the sites and the overall community, as well as other resources which may be available within a fixed timeframe. The first part of Section D suggests questions that the work group can ask at each site where contingency planning is determined to be a priority. The second part of Section D addresses questions relating to the resources of the community overall; such questions need only be answered once to satisfy the needs of the entire community contingency planning effort.

3.3 GUIDANCE

A. Preliminary Site Identification

The most important and accurate information source on the location of facilities that produce, use, store, or transport acutely toxic chemicals will be records of the local fire department and other local agencies concerned with building codes, and worker and public safety. This information can be interpreted and readily augmented by working group members with knowledge of local activities. Local officials who know and understand the community are a valuable resource. The local fire chief or head of the public health and safety department will probably be able to generate a preliminary list of sites to evaluate from his or her everyday knowledge of community industrial operations.

A main data source for information on the major manufacturers of these chemicals is the Stanford Research Institute (SRI) 1985 Directory of Chemical Producers. This directory, which is updated annually, includes cross-referenced information on the name, location, and products of more than 1,500 companies and 10,000 chemical products. The major limitation of the directory is that it only includes information for those chemicals that are produced in commercial quantities of more than 5,000 pounds total U.S. annual production. Many of the chemicals that meet EPA's criteria are not included in the directory because they have limited, specialized uses and are produced in small quantities. Nonetheless, this source, along with information published in other chemical industry directories (e.g., Chemcyclopedia, American Chemical Society, Washington, DC; Chemical Week Buyers Guide, Chemical Week, Inc., New York, NY; OPD Chemical Buyers Guide, Schnell Publishing Co., Inc., New York, NY) does provide a useful check on local records and knowledge.

Information on the primary uses of many of the chemicals that meet the acutely toxic chemical criteria is contained in chemical profiles which may be obtained from EPA (see Appendix A for a sample profile and the attached return postcard for ordering a set). This information may be useful in identifying community facilities where acutely toxic chemicals may be present. Unfortunately, information on uses of chemicals is not publicly available for all acutely toxic chemicals.

One approach for utilizing the use information in the Profiles is to convert an identified use into an activity associated with a specific product or industry. The Standard Industrial Classification (SIC) manual published by the Department of Commerce is a very useful tool for this purpose. The classification scheme includes an increasingly specific breakdown of major industry groups and products by code numbers. There are 20 major industry groups with two-digit SIC codes, which are broken down into 143 industry groups with three-digit SIC codes and about 450 industries at the four-digit SIC code level. There are also 1,500 classes of products with five-digit SIC codes and over 11,000 products with seven-digit SIC codes. Once a use for an acutely toxic chemical is identified by SIC code number at the four-digit level, it is possible to get information on the number of facilities in that group at the county or State level from various U.S. Census Bureau publications (e.g., 1982 Census of Manufacturers and County Business Patterns) and State manufacturing directories available for all 50 states from Manufacturers' News, Inc., Chicago, IL.

Information on storage and transportation of chemicals that meet the acutely toxic chemical criteria is very difficult to obtain. Community work groups will need to rely heavily on the assistance of the transportation industry to acquire useful information. (The guidance in FEMA-10 and DOT's Community Teamwork will be helpful for this purpose.)

B. Analysis of Site Specific Activities Involving Acutely Toxic Chemicals

This section provides example questions to help the community determine: (1) whether a site handles acutely toxic chemicals that meet the criteria; (2) whether chemicals are handled that have by-products, decomposition products, or combustion products that meet the criteria; (3) how much of these chemicals are on the site; (4) how these chemicals are handled on the site; (5) how near they are to the site fence line; and (6) what is the nature of the area around the site.

The work group will use the information it gathers from the site in this step to make judgments about the situation on the site and the degree of potential risk it poses to the community. The work group needs to look carefully at on-site conditions that could indicate potential problems. The physical state of the chemical (e.g., gas, liquified gas, liquid, powder, dust, solid) and the conditions under which it is handled on the site (e.g., under pressure, under high or low temperature, under inert atmosphere) are key indicators of the potential for problems on site. For example, a substance that is a gas under pressure and low temperature is apt to pose more problems upon accidental release than a powder at ambient conditions (i.e., room temperature and pressure). If a substance cannot become airborne because of its physical state and handling conditions on the site, the work group may wish to defer further efforts related to the substance. For example, non-powdered solids or viscous liquids with very low vapor pressures (i.e., less than 0.001 mmHg) handled at less than ambient temperatures are not likely to become airborne. The work group needs to think about the information it has gathered, look at the chemicals and how they are handled at the site, examine the potential for the chemical to be released and get off the site, and determine the sensitivity of populations that could be potentially exposed in the event of an accidental release. The tool, developed by EPA, to prioritize sites based upon an estimation of the "quantity of concern" for each chemical is provided in Appendix D. Consult FEMA-10 for additional help in conducting a hazard analysis.

Example Questions:

Do you have any chemicals on site that are on the list or meet the criteria?

- Which ones?
- How much is on the site? What is the range of inventory (average, maximum, minimum)?

Do you have any chemicals on site that could generate by-products, decomposition products, or combustion products that meet the criteria?

- Which ones?
- How much is on the site? What is the range of inventory (average, maximum, minimum)?

How are the acutely toxic chemicals handled or stored on site?

- Are special conditions like high or low pressure, heating, or cooling required for handling or storage?
- In what physical state(s) is the chemical found on site (e.g., gas, liquified gas, liquid, solid, dust, powder)?
- Are these chemicals handled or stored near other chemicals that are flammable, explosive, or reactive?
- Are any special precautions taken to protect the acutely toxic chemical?
- Where are these chemicals handled or stored on the site in relation to the site fence line?
- How much (maximum, minimum, average) is handled or stored in any location at any one time?

Are any of the acutely toxic chemicals transported to or from your plant?

- How large are the shipments (in tons, gallons, or pounds)?
- Is the substance shipped by rail, truck, barge, or other mode and in what kind of container (drums, bags, tank wagons, etc.)? Specify.
- How frequent are the shipments and at what time of day?
- What are the transport routes through the community to and from the site?

Have there been any past incidents involving hazardous materials at the site? What response efforts were taken? What were the results?

Is the area around the site best described as:

- Residential?
- Commercial?
- Industrial?
- Mixed?
- Agricultural?
- Special use/institutional?
- Open space?

To evaluate the potential risk, and hence the degree of need for contingency planning, it is important to determine who might be exposed in the event of a release of acutely toxic chemicals to the air. Certain segments of the population such as the elderly, children, and people with various health problems will be at greater risk in the event of a release. The demographic information needed for this purpose will probably not be in the possession of site personnel and will have to be obtained from a local government agency or community service group.

The work group should now determine if the chemical can become airborne, and if so, is there enough of the substance on the site that, if it were all accidentally released, it would result in reaching a level of concern at the site fence line (see Appendix D for guidance).

C. Site Control Measures

This section contains example questions to help the community identify the control measures a site has put in place to control releases from the various activities on the site which involve acutely toxic chemicals, or by-products, decomposition products, or combustion products that meet the criteria. The activities of interest include processing, storage, and transfer at the site.

Example Questions:

If you handle (manufacture or use) any chemicals that meet the criteria on site:

- If you have a leak, what do you do?

If you store any chemicals meeting the criteria on site:

- Do you have containment capacity available should you have a leak?

- If you have a leak from your storage area, what do you do?

Do you have any special on-site transfer procedures between the transport vehicle and on-site storage equipment for chemicals that meet the criteria?

Do you have any special on-site transfer procedures between storage and process equipment?

Do you have any safety control devices in place on transfer, processing, and storage equipment on site (e.g., system interlock, pressure relief valve, pressure/temperature control monitor, emergency cooling system, cut-off valve, vent, flare)?

Do you have alarms, warning signals, and monitors to indicate when a release occurs?

What is your plan and schedule to inspect and test the various chemical handling equipment, safety control devices, and warning devices?

If you have a failure of any transfer, processing, or storage equipment, what do you do?

D. Response Capabilities

This section contains example questions to help the community evaluate its emergency response resources and capabilities. The section is divided into two parts, one covering questions that the work group can ask a technical representative from a particular site about that site, and the second which is designed to help identify all resources within the community and requires information from a variety of local response and government agencies. The first part can be asked at each site being considered for contingency planning. The second part need only be addressed once for the entire community. This information will provide direct input into the development of the community contingency plan and will assist the work group in evaluating what additional emergency response resources may be needed in the community.

Example Questions:

1. Site

Do you have a safety plan (also referred to as an emergency or contingency plan) for your site? Is your site plan coordinated with the local community contingency plan?

- Do you have available on-site emergency response equipment (e.g., firefighting equipment, personal protective equipment, communications equipment) and trained personnel to provide on site initial response efforts?

- What equipment is available? (e.g., positive pressure respirators, chemical suits, unmanned fire monitors, foam deployment systems, radios, beepers, etc.)

- Do you have medical support both on site and at local hospitals for emergency exposures?

- Who is the emergency contact for the site (person's name, position, and 24-hour telephone number) and what is the chain of command during an emergency?

- Do you have employee evacuation plans in effect and are the employees trained to use them in the event of an emergency?
- What kind of line notification systems do you have between the site and the local community emergency services (e.g., direct alarm, direct telephone hook-up, computer hook-up) to address emergencies on-site?
- Does the site have a mechanism to alert employees and the surrounding community in the event of a release?
- How does the site educate the community about the meaning of various alarms or warning systems?
- How does the site coordinate with the community government and local emergency and medical services during emergencies?
- Does the site have any mutual aid agreements for obtaining emergency response assistance from other industry members? If so, what are they and with whom?
- Does the site have any contracts or other pre-arrangements in place with cleanup specialists for cleanup and removal of releases, or is this handled in-house? What is the response time?
- How does the site determine concentrations of released chemicals existing at the site? (Are there toxic gas detectors, explosimeters, or other detection devices positioned around the site? Where are they located?)
- Does the site have wind direction indicators positioned within the site perimeter to determine in what direction a released chemical will travel? Where are they located?
- Do you have the capability for modelling vapor cloud dispersion?
- Does the site have available auxiliary power systems to perform emergency system functions in case of power outages?
- How often is your safety plan tested and updated?

Do you have a safety training plan for your employees?

- Are your employees trained in the use of emergency response equipment, personal protective equipment, and emergency procedures detailed in the plant safety plan? How often is training updated?

- Does the site hold simulated emergencies for training purposes? How often? How are these simulations evaluated and by whom? Are the local community emergency response and medical service organizations invited to participate?

- Are employees given training in methods for coordinating with local community emergency response and medical services during emergencies? How often?

Does the site have an emergency response equipment and systems inspection plan?

- Does the site have a method for identifying emergency response equipment problems? Describe it.

- Is there testing of on-site alarms, warning signals, and emergency response equipment? How often is this equipment tested and replaced?

2. Community

What local agencies make up your community's existing response preparedness network? Some examples include:

- Fire Department

- Police/Sheriff/Highway Patrol

- Emergency Medical/Paramedic Services associated with local hospitals or fire or police departments

- Emergency Management Agency/Civil Defense

- Public Health Agency

- Environmental Agency

- Red Cross

- Other local community resources such as transportation department, public housing, communications, etc.

What is the capacity and level of expertise of the community's emergency medical facilities, equipment, and personnel?

Does the community have arrangements or mutual aid agreements for assistance with other jurisdictions or organizations (e.g., other communities, counties, or the states; industry; military installations; Federal facilities; response organizations; etc.)?

Does the community have an existing hazardous chemical contingency plan? Has the community performed contingency planning for emergencies involving releases of acutely toxic chemicals or other hazardous chemicals as part of a general plan used for all emergencies?

- What is the current status of community contingency plan/planning for acutely toxic chemicals or other hazardous chemical emergencies?
- Does your community maintain an up-to-date technical reference library of response procedures for chemicals?
- Is there some community planning and coordination body (e.g., task force, advisory board, interagency committee)? If so, what is the defined structure and authority of the body?
- Has the community undertaken any surveys or assessments of potential risks to the community from facility or transportation accidents involving hazardous chemicals?
- Has the community performed any assessments of existing prevention and response capabilities within its own local emergency response network?
- Have there been any training seminars, simulations, or mock accidents performed by the community in conjunction with local industry or other organizations? If so, how frequently are they conducted?
- If a hazardous chemical plan exists, is it integrated into any existing community contingency plans for other emergencies?

Who are the specific community points of contact and what are their responsibilities in an emergency?

- List the agencies involved, the area of responsibility (e.g., emergency response, evacuation, emergency shelter, medical/health care, food distribution, control access to accident site, public/media liaison, liaison with Federal and State responders, locating and manning the command center), the name of the contact, position, 24-hour telephone number, and the chain of command.
- Is there any specific chemical or toxicological expertise available in the community, either in industry, colleges and universities, or on a consultant basis?
- What kinds of equipment and materials are available on the local level to respond to emergencies? How can you get the equipment, materials, and manpower to the scene of an accident?

Does the community have specialized emergency response teams to respond to acutely toxic chemical or other hazardous chemical emergencies?

- Have the local emergency services (fire, police, medical) had any hazardous chemical training, and if so, do they have and use any specialized equipment?
- Are there specialized industry response teams (e.g., CHLOREP, AAR/BOE), State/Federal response teams, or contractor response teams available within or close to the community? What is the average time for them to arrive on the scene?
- Has the community sought any resources from sites to help respond to emergencies?

Is the community emergency transportation network defined?

- Does the community have specific evacuation routes designated? What are these evacuation routes? Is the general public aware of these routes?
- Are there specific access routes designated for emergency response and services personnel to reach facilities or accident sites?

Does the community have other procedures for protecting citizens during emergencies (e.g., remain indoors, wear gas masks)?

Is there a designated emergency communications network in the community to alert the public, update the public, and provide communications between the command center, the accident site, and off-scene support?

- What does the communications network involve (e.g., special radio frequency, network channel, siren, dedicated phone lines, computer hook-up)?

Is there an up-to-date source list with a contact, position, and phone number for technical information assistance? This can be Federal (e.g., NRC, USCG CHRIS/HACS, CDC, HMTC, OHMTADS), State, industry associations (e.g., CHEMTREC, CHLOREP, AAR/BOE, PSTN), and local industry groups (e.g., local AIChE, ASME, ASSE chapters).

Is there a source list with a contact, position, and phone number for community resources available?

- Does the list of resources include: wreck clearing, transfer, transport, cleanup, disposal, analytical sampling laboratories, and detoxifying agents?

Have there been any past facility and transportation incidents involving hazardous materials in the community? What response efforts were taken? What were the results?

3.4 SUMMARY AND NEXT STEPS

Once a community work group has:

A. Identified a preliminary list of sites to evaluate for further contingency planning (Section A),

B. Identified sites where acutely toxic chemicals or chemicals that have by-products, decomposition products, or combustion products that meet the criteria are located and performed an analysis of the potential hazards (Appendix D) to the community public health and safety in the event of a release to the air (Section B),

C. Identified the safety control measures in place on the activities at the sites to control releases of acutely toxic chemicals (Section C), and

D. Identified the emergency response capabilities and resources both at each site of concern and within and around the entire community for responding to potential emergencies (Section D),

it can then identify where the community needs to augment current response preparedness capabilities and planning to address acutely toxic chemicals. The work group should then proceed with efforts to develop a contingency plan to address these needs. The following chapter provides specific guidance to assist the group towards those ends.

4. CONTINGENCY PLAN DEVELOPMENT AND CONTENT

4.1 INTRODUCTION

This chapter presents and discusses a comprehensive list of the elements of a contingency plan for responding to acutely toxic chemical accidents. Communities that are adapting an existing plan or incorporating this within a more general contingency plan, can use the list in Section 4.2 to evaluate the present plan and identify what elements need to be added, deleted, or amended in order to deal with the special problems associated with the accidental release into air of acutely toxic chemicals. It will quickly be evident that some elements in the list are simple and easy to accomplish, while other elements will require a significant amount of work.

The plan elements will be presented in the form of a sample outline, delineating the items that should be included in a comprehensive plan and how these items might best be arranged. **The sample outline is not a model. It is not meant to constrain any community. Indeed, each community should seek to develop a plan that is best suited to its own circumstances, taking advantage of the sample outline as is appropriate.**

The type of plan envisioned in the sample outline presented below is a comprehensive plan that would affect all governmental and private organizations involved in emergency response operations in a particular community. Its basic purpose would be to provide the necessary data and documentation to anticipate and coordinate the many persons and organizations that would be involved in emergency response actions. As such, this sample plan outline is not intended to be a "hip-pocket" emergency response manual, although sections of the plan could, with some revisions, be used for such a purpose. Nor is the plan envisioned in the sample outline intended to serve as a detailed "Standard Operating Procedures" manual for each of the many agencies and organizations involved in emergency response actions, although it could certainly be used as a starting point for such a manual.

As stated in Chapter 1, this guidance is meant to enhance community preparedness and response capability. The development of community awareness and a contingency plan are only means to achieving these ends. Communities should recognize that developing community awareness and a contingency plan are part of the process of becoming better prepared to respond to an incident.

The sample outline is presented in Section 4.2. The sections following will discuss the content of specific plan elements and present suggestions on how to go about developing a plan.

4.2 SAMPLE OUTLINE OF A CONTINGENCY PLAN

The following outline is adapted from the general outline presented in Section 4 of FEMA-10 to deal with the special case of responding to acutely toxic chemicals:

- i. Emergency Response Notification Summary
- ii. Record of Amendments
- iii. Letter of Promulgation
- iv. Acknowledgment
- v. Table of Contents

I. Introduction

- A. Abbreviations and Definitions
- B. Purpose
- C. Relationship to Other Plans
- D. Assumptions/Planning Factors
- E. Concept of Operations
  - 1. Governing Principles
  - 2. Organizational Roles

II. Emergency Response Operations

- A. Notification of Release
- B. Initiation of Action
- C. Coordination of Decision-Making
- D. Public Information/Community Relations
- E. Personal Protection/Evacuation
- F. Resource Management
- G. Personnel Safety
- H. Acutely Toxic Chemicals
- I. Countermeasures
- J. Response Action Checklist
- K. Attachments
  - 1. Emergency Assistance Telephone Roster
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III. Appendices

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C. Administrative and Other Support Documentation
   1. Plan Distribution
   2. Procedures for Changing or Updating Plan
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   5. Technical Library

(As noted in Chapter 1, FEMA-10 is now under joint revision by FEMA and EPA. The revised document will include materials contained here and will ultimately replace both this chapter and Chapter 5. Planners should consult FEMA-10 for additional assistance in contingency planning.)

4.3 GENERAL OBSERVATIONS ABOUT THE SAMPLE OUTLINE

A contingency plan should help a community respond quickly and efficiently to an accident. The section of the plan entitled "Emergency Response Operations" details what must be done in an emergency. This section is the core of the plan and it should be readily accessible. The "Introduction" describes the scope and background assumptions of the plan. Gathered into the appendices is a variety of materials including post-emergency operations, methods for maintaining an up-to-date operational plan, and sets of information accumulated during the planning process. A brief preliminary section at the front includes preface materials not central to the plan itself.

The sample outline is large and complex. Anyone developing a contingency plan for the first time could be overwhelmed by the prospect of having to produce such a comprehensive plan. The following observations might be helpful to community planners.

Some sections of the plan are far more important than other sections at the time of a real emergency. In fact, if a really good plan is developed, probably only Section II ("Emergency Response Operations") will be needed at the time of an accidental release.

Some sections of the plan can be written towards the end of the planning process and will serve merely to make the plan better organized and more useful. As an example, the preliminary five sections could all be prepared quite quickly when the finishing touches are being put on the plan.

Some sections of the plan are collections of information. Such information might have taken a great deal of time to gather and organize, but it is not part of response operations. These sections will have been used when you put together Section II. Examples of such sections are Appendices A.1, A.3, A.5, and C.5.

Some sections describe activities to be performed after an accident, but not precisely at the time of the accidental release. Because they are relatively less urgent, these activities are not included in Section II. Examples of this can be found in Appendices B.1 and B.2.

4.4 HINTS FOR WRITING A PLAN

Everyone will go about planning in a different way. Nevertheless, it is possible to suggest a few steps that will facilitate the planning process. Let us presume that a community has a planning leader and work group.

Begin by deciding whether a plan is actually needed and what its scope should be. For help in this step, see Chapter 3. The hazards identification and analysis generated through this process will ultimately be included as Appendix A.3 of the contingency plan. Information concerning available resources will be gathered in Section II.F, "Resource Management."

Throughout the planning process much information will be gathered. From the beginning sort out and categorize this information. For example, maintain a list of laboratory and consultant resources for Appendix A.5. Organize information about Federal and State disaster response assistance for Appendix A.4. Maintain a file on any legal requirements for Appendix A.1 in the final plan. Similarly, write down all educational opportunities for Appendix C.4.

Assign someone to begin an up-to-date telephone roster. Planners should periodically collate helpful phone numbers. This roster will be an integral part of the plan as an attachment to Section II.

As soon as the hazards identification and analysis reveals the need for a plan, have someone begin gathering detailed information about acutely toxic chemical substances. He/she can use EPA's profiles, local chemical plants, and other hazardous materials lists. This will become Appendix A.2 and will also influence the content of Section II.H.

Also, when the need for a plan is evident, have a group begin on Section II. This will require much work, meetings with potential response personnel, research for information, and in some cases, preliminary simulation exercises. When this section is finished, the plan is nearly completed. Section II should be tested by means of simulation exercises. (Plan appraisal techniques are discussed at the beginning of Chapter 5.) If such testing reveals flaws in Section II, the planners must be prepared to make revisions. When Section II is finally judged workable, the various plan sections should be collated, preface materials should be composed, and the plan can be adopted under appropriate community procedures and then published.

The final plan should be kept in a loose-leaf binder so that additions and corrections can easily be made. Planners seeking detailed assistance in the actual development of a contingency plan should contact State or Federal Regional staff (see Appendix G).

4.5 EXTENDED COMMENTS ON THE SAMPLE OUTLINE OF A CONTINGENCY PLAN

We shall now describe in some detail what sorts of information could be included in each element of the contingency plan.

Plan Section i: Emergency Response Notification Summary

- 24-Hour emergency response hotline telephone numbers
    - -- Local number to notify area public officials and response personnel
    - -- National Response Center (800-424-8802)
- Essential emergency reporting information including:
    - -- Name and telephone number of caller
    - -- Location, source, and nature (e.g., leak, explosion, derailment) of accidental release
    - -- Number of dead or injured
    - -- Name of acutely toxic chemical released
    - -- Time of release
    - -- Type of release (e.g., instantaneous, continuous, intermittent)
    - -- Amount of chemical released so far/duration of release
    - -- Total amount of chemical that may be released
    - -- Present status of the chemical (gas, liquid, etc.)
    - -- Whether significant amounts of the chemical appear to be entering the atmosphere
    - -- Direction of vapor clouds or plumes
    - -- Weather conditions
    - -- Local terrain conditions
    - -- Possible health effects/medical emergency information
- Other agencies (with telephone numbers) to notify immediately (e.g. hospitals, Red Cross, CHEMTREC, etc.)

Comment: The local 24-hour emergency response hotline should be called first. Provision should be made for notifying nearby municipalities and counties that could be affected by a vapor cloud.

Answers to some of these questions may be unknown by the caller, but it is important to gather as much information as possible very quickly in order to facilitate decisions on public notification and evacuation. Normally, the organization that operates the emergency response hotline is responsible for informing others (e.g., hospitals, Red Cross, etc.) once the initial notification is made. To ensure that the appropriate Federal On-Scene Coordinator (OSC) is notified of a release, the National Response Center operated by the U.S. Coast Guard, should be included in the notification listing. It should be noted that the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) requires that the National Response Center be notified of releases of many toxic chemicals under the so-called Reportable Quantity (RQ) provisions. We are suggesting here, however, that the National Response Center be notified anytime a release occurs. The National Response Center telephone number is 800-424-8802 (202-426-2675 in the Washington, D.C., area).

This emergency response notification section should be:

BRIEF -- never more than one page in length.

EASILY ACCESSIBLE -- located on the cover or first page of the plan. It should also be repeated at least once inside the plan, in case the cover is torn off.

SIMPLE -- reporting information and emergency telephone numbers should be kept to a minimum.

Plan Section ii: Record of Amendments

- Change record sheet
    - -- Date of change
    - -- Recording signature
    - -- Page numbers of changes made

Comment: Maintaining an up-to-date version of a plan is of prime importance. When corrections, additions, or changes are made, they should be recorded in a simple bookkeeping style so that all plan users will be aware that they are using a current plan.

All that is necessary for this page is a set of columns indicating date of change, the identification number for each change made, and the signature of the person making the change. It is also a good idea to include a notice of where to report changes on this same sheet.

Plan Section iii: Letter of Promulgation

- Statement of plan authority

Comment: This letter, signed by the community's chief executive, is a statement of legal authority and responsibility for putting the plan into action. To the extent that the execution of this plan involves various private- and public-sector organizations, it may be appropriate to include here letters of agreement signed by officials of these organizations.

Plan Section iv: Acknowledgement

- Identification of plan contributors

Plan Section v: Table of Contents

- List of topical sections, figures and tables

Comment: Response to releases of acutely toxic chemicals must be speedy. Page references in the table of contents should be clear. It is recommended that key sections be tabbed so that they can quickly be found in an emergency. Critical maps, charts, and figures should also be clearly listed by page numbers and tabbed.

Plan Section I: Introduction

Plan Section I.A: Abbreviations and Definitions

Comment: Frequently-used abbreviations and acronyms, as well as the definitions of technical terms, should be gathered here for easy reference.

Plan Section I.B: Purpose

Comment: This should be a clear and succinct statement of when and how the plan is meant to be used. It is appropriate to list those facilities and transportation routes explicitly considered in the plan.

Plan Section I.C: Relationship to Other Plans

Comment: A major task of the planning group is to integrate planning for acutely toxic chemical accidents into already existing plans. Where there is more than one facility in a community, it is probable that several contingency plans have been prepared. **It is essential to coordinate these plans.** When more than one plan is put into action simultaneously, there is a real potential for confusion among response personnel unless the plans are carefully coordinated. All contingency plans which might be employed in the event of an accidental release of an acutely toxic chemical should be listed in this section. The National Contingency Plan, the Federal Regional Contingency Plan, and any State plan should be referenced. Of special importance are all local contingency plans.

Plan Section I.D: Assumptions/Planning Factors

- Geography
- Climate

- Particular characteristics of each facility and the transportation routes for which the plan is intended
  - -- On-site details
  - -- Neighboring population
  - -- Surrounding terrain
- Assumptions

Comment: Information for this section will be gathered from the hazards identification and analysis done by planners. This is not the entire hazards identification and analysis (see Appendix A.3). Rather, this section is a summary overview of precisely what local conditions make a contingency plan necessary. Assumptions are the advance judgments concerning what would happen in the case of an accidental release. For example, planners might assume that a certain percentage of local residents will spontaneously evacuate the area along routes other than specified evacuation routes.

Plan Section I.E: Concept of Operations

Plan Section I.E.1: Governing Principles

Comment: The plan should include brief statements of precisely what is expected to be accomplished if an accident should occur. For example, if a community has limits on its evacuation capabilities, one governing principle would be that emergency response actions will address these constraints.

Plan Section I.E.2: Organizational Roles

- Municipal government
  - -- Chief elected official
  - -- Emergency management director
  - -- Communications personnel
  - -- Fire service
  - -- Law enforcement
  - -- Department of Public Health
  - -- Department of Public Works
  - -- Environmental Agency
- County government
- Facility/Transportation officials
- Nearby municipal and county governments
- State government
  - -- Environmental protection organization
  - -- Emergency management organization

- Federal government
    - -- EPA
    - -- FEMA
    - -- DOT
    - -- U.S. Coast Guard
    - -- OSHA

Comment: This section lists all those organizations and officials who are responsible for planning and/or executing the response to an accident involving acutely toxic chemicals. The role of each organization/official should be clearly described. (N.B. The above list is not meant to be complete. Each community will need to identify all the organizations/ officials who are involved in the local planning and response process.)

Plan Section II: Emergency Response Operations

Comment: **This section constitutes the most important operational section of the plan. It serves as the basis for initiating and coordinating all of the various actions that must take place at the time of an actual release. This section includes clear and specific instructions for action and coordination.**

Plan Section II.A: Notification of Release

Comment: This section is exactly the same as Plan Section i, Emergency Response Notification Summary, that appears on the first page of the plan. Because speed of response is essential in an acutely toxic chemical release, this initial data gathering cannot be prolonged. Nevertheless, an accurate record of crucial data is essential.

The local 24-hour emergency response hotline should be called first. Provision should be made to notify nearby municipalities and counties that could be affected by a vapor cloud.

The National Response Center is to be notified by calling 800-424-8802. In the Washington, D.C., area call 202-426-2675.

Plan Section II.B: Initiation of Action

- Name of on-scene authority
- Method for establishing command post and communications network for response team(s)
- Method for activating emergency response teams
- List of priorities for response actions (see Plan Section II.J)

- Method for alerting the public
  - -- Title and telephone number of person responsible for alerting the public as soon as word of the accident is received
  - -- List of essential data to be passed on (e.g., health hazards, precautions for personal protection, evacuation routes and shelters, hospitals to be used)

Comment: This section is of urgent significance. Since this plan is concerned with **life-threatening chemicals**, speed of response is crucial. It is not enough to have planned for alerting the community; one organization must be assigned the responsibility of alerting the public as soon as word of the accidental release is received. Delay in alerting the public can lead to the loss of human lives.

Section II.K of the plan will include much of the specific information needed to initiate the response. In addition to sirens and the Emergency Broadcast System, it may be necessary to use mobile public address systems and/or house-by-house contacts. In this case, adequate protection must be provided for persons entering the area to provide such help.

Plan Section II.C: Coordination of Decision-Making

- Lead organization
- Chain of command (illustrated in a block diagram)

Comment: Response to an acutely toxic chemical release will involve many participants: police, firefighters, facility personnel, health personnel, and others. It is also possible to have more than one organization to perform the same service; for example, local police, the county sheriff and deputies, as well as the highway patrol may respond to perform police functions. Because speed of response is so important, coordination is needed among the various agencies providing the same service. It will prove helpful to identify (by title) the one individual responsible for each participating organization, and the one individual responsible for each major function and service. Of course, the plan should clearly identify the lead agency for responding to acute hazards incidents.

Work out, in advance, the following:

(1) Who will be in charge (lead organization)
(2) What will be the chain of command
(3) Who will maintain the command post and keep it secure
(4) Who will have advisory roles (and what their precise roles are)
(5) Who will make the technical recommendations on response actions to the lead agency

(6) How do the participants keep each other informed
(7) Who (if anyone) will have veto power

This chain of command should be clearly illustrated in a block diagram.

Special consideration must be given to the on-going communications listed as #6 above. Different response organizations typically use different radio frequencies. Therefore, specific provision must be made for accurate and efficient communication among all the various organizations during the response itself.

Plan Section II.D: Public Information/Community Relations

- Method for keeping the public informed

  -- provision for one person to serve as liaison to the public
  -- list of radio and T.V. contacts

  It is important to provide accurate information to the public in order to prevent panic. Some citizens simply want to know what is happening. Other citizens may need to be prepared for possible evacuation or they may need to know what they can immediately do to protect themselves. Because information will be needed quickly, radio and television are much more important than newspapers in acutely toxic chemical releases. **One person should be identified to serve as spokesman**. The chain of command should include this spokesman. Other members of the response team should be trained to defer all communications and public relations issues to this one person.

Plan Section II.E: Personal Protection/Evacuation

- Chemical-specific personal protection plan

- Name of person who can order an evacuation

- Risk zones where evacuation could be necessary and a method for notifying these places

- Methods for controlling traffic flow

- Shelter locations and other provisions for evacuations (special assistance for hospitals, etc.)

Comment: Evacuation is the most sweeping response to an accidental release. The plan should clearly identify under what circumstances evacuation would be appropriate and necessary. Plans also need to be made for communicating specific personal protection information to the community. For example, for some chemicals it is safer to keep citizens inside with doors and windows closed rather than to evacuate. It is also important to distinguish between general evacuation of the entire area and selective evacuation of a part of the risk zone. Provision must be made for quickly moving traffic out of the risk zone and also for preventing outside traffic from entering the risk zone. If schools are located in the risk zone, the plan must identify the location to which students will be moved in an evacuation. All of this information should be listed in the Attachments in Section II.K.

Plan Section II.F: Resource Management

- List of personnel needed for emergency response
- List of vehicles needed for emergency response
- List of equipment needed for emergency response

Comment: This section must list the resources that will be needed, and where the equipment and vehicles are located or can be obtained. A major task in the planning process is to identify what resources are already available and what must still be provided. This section should also address funding questions.

Plan Section II.G: Personnel Safety

- Standard order of procedure for entering and leaving sites
- Accountability for personnel entering and leaving the hazardous site
- Recommended safety equipment
- Personal safety precautions

Comment: Section II.F will list safety equipment that is necessary to carry out response actions. This section should note any personal safety precautions and special equipment that are appropriate for each acutely toxic chemical to be found in the community. Consult local chemical industries and/or EPA's training course, or other Federal or State safety or response courses, for helpful information.

Plan Section II.H: Acutely Toxic Chemicals

- CHEMTREC Phone Number: 800-424-9300 (District of Columbia: 202-483-7616) -- The Chemical Transportation Emergency Center (CHEMTREC), a 24-hour-a-day telephone service operated by the Chemical Manufacturers Association, can provide information useful to on-scene responders to any chemical emergency.
- List of appropriate data for acutely toxic chemicals in your community (for use on-scene)

Comment: Each community will prepare this section differently. A formal hazards identification and analysis will identify each acutely toxic chemical that is to be found in the community.

Communities that have a large number of these substances in their midst will probably simply list those chemicals here and refer to the appropriate sections of Appendix A.2. If only a few chemicals are found in a community, then this section of the plan should list the properties of each chemical, with special consideration to their toxicity, reactivity, toxic effects, and steps to counteract their hazardous action in the human body. This information should be presented in brief, clear box diagrams so that response teams can act quickly to save human lives. This information is published as Chemical Profiles with EPA's list of acutely toxic chemicals. Planners can also consult CHEMTREC, DOT's 1984 Emergency Response Guidebook, USCG CHRIS Manual, and other hazardous materials listings.

Plan Section II.I: Countermeasures

- Exposure assessment
- Containment and mitigation actions
- Cleanup methods
- Restoration of the surrounding environment

Comment: After the official notification that a release has occurred, it is still crucial to monitor the release and assess its impact. Usually the facility at which the release has occurred will have the best equipment for this purpose. If the Federal OSC arrives quickly at the scene, his/her resources can be employed.

A clear and succinct list of appropriate containment countermeasures should be prepared for each acutely toxic chemical in the community. This section should be coordinated with section II.G on "Personnel Safety" so that response teams are not subjected to undue danger. Much of this information will be found in the chemical profiles (see Appendix A for a sample profile); other hazardous material publications should be consulted also.

It is important to determine whether a fire should be extinguished or allowed to burn itself out. Water used in firefighting could become contaminated and need to be contained. In addition, some materials may be water-reactive and pose a greater hazard in contact with water. Some vapors may condense into pools of liquid which must be contained and removed. Accumulated pools may be recovered with appropriate pumps, hoses, and storage containers. Various foams may be used to reduce vapor generation rates. Water spray or fog may be applied at downwind points away from "cold" pools to absorb vapors and/or accelerate their dispersal in the atmosphere. Volatile liquids might be diluted or neutralized.

If the vapor comes to the ground on crops, on playgrounds, in drinking water, or other places where humans are likely to be affected by it, the area should be tested for contamination. Of course, appropriate steps must be taken if animals are in contact with the chemical. It is important to identify in advance what instruments and methods can be used to detect the chemicals in question.

Restoration of the area is a long-range project, but general restoration steps should appear in the plan.

Plan Section II.J: Response Action Checklist

Comment: Response action checklists are a way of condensing much useful information. They are helpful for a quick assessment of the response operation. If checklists are used, they should be prepared in sufficient detail to ensure that all crucial activities are included. For help in preparing a checklist consult FEMA-10.

Plan Section II.K: Attachments

Comment: Gathered here are various clear and precise guides for action during the emergency. Some communities might choose to print these attachments separately and distribute them to the personnel most likely to need them during an emergency. Never presume that any responder has memorized every aspect of his/her role. Exact printed directions should be readily available for immediate use in an emergency. The following suggested list of attachments is not meant to be exhaustive; some communities might choose to include other items as additional attachments.

Plan Section II.K.1: Emergency Assistance Telephone Roster

- List of telephone numbers for:
    - Participating agencies
    - Technical and response personnel
    - Public and private support groups
    - CHEMTREC

Comment: An accurate and up-to-date 24-hour a day emergency telephone roster is an essential item. Briefly indicate the types of expertise, services, or equipment that each agency or group can provide. All phone numbers and names of personnel should be verified at least annually. Whenever alternate numbers are available, these should be listed. This section of the plan should be able to stand alone so that copies can be carried by public safety people and others. Examples of names for possible inclusion in a telephone roster, similar to those found in FEMA-10, are as follows:

- -- Police
- -- Fire
- -- Civil Defense
- -- Public Works
- -- Rescue Squad
- -- Hospitals
- -- Utilities
- -- Community Officials
- -- Bordering Political Regions
- -- Industries
- -- Volunteer Groups
- -- Media

Plan Section II.K.2: Siren Coverage

Comment: This section should contain precise information on how sirens or other signals will be used to notify the public in case of an emergency. This should include information on what the different signals mean, how to coordinate the use of sirens at different facilities, how to activate the sirens, and the geographic area covered by each siren.

Plan Section II.K.3: Emergency Broadcast System Messages

Comment: Sample EBS messages should be prepared with blanks that can be filled in with precise information about the accident. One sample message should be for an evacuation. One sample message should describe any necessary school evacuations so that parents will know where their children are. One sample message should be prepared to tell citizens to take shelter and other precautions to protect themselves.

Plan Section II.K.4: Evacuation Routes

Comment: Maps with evacuation routes and alternates clearly identified should be prepared for each risk zone in the area. Such maps should take account of prevailing wind patterns.

Plan Section II.K.5: Traffic Control Points

Comment: In order to expedite an evacuation, maps should indicate control points where police officers should be stationed.

Plan Section II.K.6: Access Control Points

Comment: In order to restrict traffic from entering a risk zone, maps should indicate all access control points.

Plan Section II.K.7: Evacuation Routes for Special Populations

Comment: In an evacuation schools, hospitals, nursing homes, and homes for the physically and mentally disabled will require special attention. Maps should indicate precise routes to another location where special populations can be taken during an emergency evacuation, and the methods of transportation during the evacuation.

Appendix A: Basic Support Documents

Appendix A.1: Legal Authority and Responsibility for Responding

- Authorizing legislation (if any)
  - -- Federal (e.g., Clean Water Act, CERCLA, National Contingency Plan, and the Disaster Relief Act)
  - -- State
  - -- Regional
  - -- Local
- Mandated agency responsibilities

Comment: If there are laws regarding contingency planning for response to acutely toxic chemical releases, list them here. The community may choose to enact legislation in support of its plan. Be sure to identify any agencies (e.g., FEMA) that must respond to particular emergencies.

Appendix A.2: Acutely Toxic Chemicals Information

- Technical information
  - -- Chemical and physical properties
  - -- Toxicity
  - -- Measurement techniques
  - -- Recommended fire-fighting techniques
  - -- Response personnel safety data
  - - General public safety data
  - -- First aid procedures

Comment: This section should provide technical support information on acutely toxic chemicals. Some planners could simply include here various hazardous materials publications, including EPA's chemical profiles (see Appendix A for a sample profile). Plan Section II.H will refer users to this appendix in order to find specific information about the chemical involved in the accidental release.

An alternative is to include data only for those chemicals to be found locally. If the second option is chosen, plan revisors must be careful to update this section if and when any new acutely toxic chemicals begin to be used, produced, stored, or transported in the community.

Appendix A.3: Hazards Identification and Analysis

- Probable hazards
- Vulnerable locations

Comment: This analysis is a crucial aspect of the planning process. It consists of determining where hazards are likely to exist, what places would most likely be adversely affected, and what acutely toxic chemical substances could be involved. To prepare a hazards analysis, consult Chapter 3 of this guidance, FEMA-10, and DOT's Community Teamwork and demonstration projects.

Individual data sheets and maps for each facility and transportation route of interest could be included in this section. Similar data could be included for recurrent shipments of chemicals through the area. In communities with many facilities the hazards analysis could be too massive to include in the contingency plan. In that case, all significant details should be summarized here. This appendix should never become as brief as the summary found toward the beginning of the plan in Section I.D, Assumptions/Planning Factors.

Appendix A.4: Response Organization Structure/Coordination

- Specialized response organization
  - -- Chain of command/lead agency
  - -- Assigned duties
- How to use outside resources
  - -- Response capabilities
  - -- Procedure for using outside resources
- Predetermined arrangements

Comment: This appendix contains detailed descriptions and information on the Federal Regional Response Teams and the predesignated Federal OSC (see Chapter 2 of this guidance). Because of their distant location it is often difficult for such organizations to reach a scene quickly; planners should determine in advance approximately how much time would elapse before the Federal OSC could arrive at the scene.

This appendix should also indicate where other disaster assistance can be obtained from Federal, State, or regional sources. Pre-arrangements can be made with higher-level government agencies, bordering political regions, and chemical plants; provisions should be made for coordinating with other contingency plans and the local civil defense disaster plan.

Any coordination with outside agencies should be formalized through mutual aid agreements or memoranda of understanding specifying delegations of authority, responsibility, and duties. These formal agreements can be included in the plan if desired.

Appendix A.5: Laboratory, Consultant, and Other Technical Support Resources

- Telephone directory of technical support services
  - -- Laboratories (environmental and public health)
  - -- Private consultants
  - -- Colleges or universities (chemistry departments and special courses)
  - -- Local chemical plants

Comment: This section should identify the various groups capable of providing technical support and the specific person to be contacted. These technical experts can provide advice during a disaster and also be of great service during the development of this plan. For this reason, one of the first planning steps should be the gathering of information for this section.

Appendix A.6: Computer Utilization

- Available software for the planning process and response capability

Comment: Computers can be very valuable for storing and retrieving large volumes of data, accessing data bases, estimating evacuation or hazard zones, keeping track of the overall planning process, and on-scene capabilities to predict wind dispersion of a chemical. Word processing capabilities can facilitate plan preparation, updates, and distribution.

Appendix B: Post-Emergency Operations

Appendix B.1: Documentation of Accidental Releases

- List of required reports
- Reasons for requiring the reports
- Format for reports

Comment: This appendix indicates what information should be gathered about the release and the response operation. Key response personnel could be instructed to maintain an accurate log of their activities.

Appendix B.2: Investigative Follow-Up

- Methods for determining whether the response mechanism worked properly

Comment: Identify in this section who is responsible for the post-accident investigation to discover quickly the exact circumstances and cause of the accidental release. The documentation described in Appendix B.1 should help this investigation determine if response operations were effective, whether the contingency plan should be amended, and what follow-up responder and public training programs are needed.

Appendix C: Administrative and Other Support Documentation

Appendix C.1: Plan Distribution

- List of organizations/persons receiving plan

Comment: The entire plan should be available to the public; it can be stored at a library, the local emergency response office, or some other public place. Individual sections of the plan should be distributed to all persons responsible for response operations. The plan distribution list should account for all organizations receiving such copies of the plan. This information is essential when determining who should be sent revisions and updates to the plan.

Appendix C.2: Procedures for Changing or Updating Plan

- Title and organization of responsible person(s)
- Change notification procedures
- Change frequency

Comment: Responsibility should be delegated to someone to make sure that the plan is updated frequently and that all plan holders are informed of the changes. Notification of changes should be by written memorandum or letter; the changes should be recorded in the RECORD OF AMENDMENTS page at the front of the completed plan. Changes should be consecutively numbered for ease of tracking and accounting.

Following are examples of information that must regularly be checked for accuracy:

(1) Identity and phone numbers of response personnel

(2) Name, quantity, properties, and location of acutely toxic chemicals in the community. (If a new acutely toxic chemical begins to be made, used, stored, or transported in the community, revise the plan as needed.)

(3) Facility maps

(4) Transportation routes

(5) Emergency services available

This topic is considered in greater detail in Chapter 5 of this guidance.

Appendix C.3: Exercises

- Provision for regular tabletop and field simulation exercises

Comment: Exercises or drills are an important tool in keeping a plan functionally up-to-date. These are simulated accidental releases where emergency response personnel act out their duties. The exercises can be tabletop, and/or they can be realistic enough so that equipment is deployed, communication gear is tested, and "victims" are sent to hospitals with simulated toxic exposures. Planners should work with local facilities when conducting simulation exercises. In addition, the public should be involved or at least informed of these exercises. EPA is also providing guidance on simulation exercises through its forthcoming training program complementing this guidance.

This section should specify:

(1) The organization in charge of the exercise;

(2) The frequency of exercises; and

(3) A procedure for evaluating performance and making changes to contingency plans as necessary (see Appendix C.2 of this sample outline and Chapter 5 of this guidance).

Appendix C.4: Training Requirements

- Required training for response personnel
- Courses, seminars, workshops that are required or recommended; include only those available to local response personnel

Comment: Care should be taken to provide essential information and training for response personnel. Training is available from State agencies and the Federal government (e.g., EPA, FEMA, and the U.S. Coast Guard).

Communities seeking help in developing preparedness and response programs should consult appropriate State agencies. States may consult with Federal Regional offices for additional training and assistance (see Appendix G). EPA is developing new training programs to complement this Chemical Emergency Preparedness Program Guidance.

In addition to government agencies, consult universities or community colleges (especially any fire science curriculum courses), industry associations, the National Fire Protection Association, and private firms (facilities, common carriers). Many training films and slide presentations can be borrowed or rented at little cost. Many chemical companies and carriers provide some level of training for free.

In addition to classroom training, response personnel will need hands-on experience with equipment to be used during an emergency.

Appendix C.5: Technical Library

- List of references and their availability
  - General planning references
  - Specific references for acutely toxic chemicals
  - Technical references and methods for using national data bases
  - Maps

Comment: The appendix to this guidance document lists some planning resources and how to acquire them. Facilities can provide specific publications dealing with acutely toxic chemicals. This section of the plan will list those published resources that are actually available in your community. You will also list any maps (e.g., of facilities, transportation routes, etc.) that will aid in the response to an accidental release.

It is important for planners to acquire and understand available hazardous materials data bases. Response guides such as FEMA-10 should also be available locally.

5. CONTINGENCY PLAN APPRAISAL AND CONTINUING PLANNING

Any contingency plan must be evaluated and kept up-to-date through simulation exercises as well as by the regular collection of new data. Effective emergency preparedness requires periodic review and evaluation, and the necessary effort must be sustained at the community level without case-by-case Federal approval. Plans should reflect any recent changes in: the economy, available technology, toxic chemicals present, Federal and State laws, road configurations, population size, emergency telephone numbers, and facility location. This chapter describes key aspects of appraisal and provides specific guidance for maintaining an updated contingency plan. Planners may want to consult Chapter 5 of FEMA-10 for complementary material.

5.1 PLAN APPRAISAL

It is not sufficient merely to read over the plan in search of omissions and/or errors. **The draft plan should also be evaluated through simulation exercises to see if its required activities are actually possible in reality and if the evaluation would reveal more efficient ways of responding to a real emergency.** Experience gained from real emergencies should be used to update the plan. Simulations can be full-scale field exercises or tabletop exercises.

A field simulation exercise is a mock emergency in which the response organizations that would be involved in an actual emergency perform the actions they would take in the emergency. These simulations may focus on limited objectives (e.g., testing the evacuation capability of local hospitals). The responsible environmental, public safety, and health agencies simulate, as realistically as possible, the notification, hazard identification and analysis, command structure, command post staging, communications, health care, containment, evacuation of affected areas, cleanup, and documentation. Responders use the protective gear, radios, and response equipment and act as they would in a real incident.

A low-cost, yet still valuable, version of a simulation exercise is the staging of an indoor role-play, also called a tabletop exercise. In this exercise, each agency representative describes and acts out what he or she would do at each step of the response under the circumstances given. Simulation exercises are most beneficial when followed by a meeting of all participants to critique the performance of those involved and the strengths and weaknesses of the plan's operation. The contingency plan should be amended according to the lessons learned.

The details of how to conduct a plan appraisal should be included in Appendix C.3 of the completed plan.

5.2 KEEPING THE PLAN UP-TO-DATE

All contingency plans become outdated because of social, economic, and environmental changes. Keeping the plan up-to-date is a difficult task, but can be controlled by scheduling reviews regularly. Outdated information should be replaced, and the results of appraisal exercises should be incorporated into the plan. The following techniques will aid in keeping abreast of the changes:

- Establish a regular review period, preferably every six months, but at least annually.
- Make one organization responsible for coordination of the review and overall stewardship of the plan. Choose with reliability in mind.
- Be prepared to reactivate the work group which developed the original plan.
- Include a "Record of Amendments and Changes" sheet in the front section of the plan.
- Include a "Where to Report Changes" notice in the plan and a request for holders of the plan to report any changes or suggested revisions to the responsible organization.
- Make any sections of the plan that are subject to frequent changes either easily replaceable (e.g., looseleaf, separate appendix), or provide blank space (double- or triple-spaced typing) so that old things can be crossed out and new data easily written in. This applies particularly to telephone rosters and resource and equipment listings.

The organization responsible for review should do the following:

- Maintain a list of plan holders, based on the original distribution list, plus any new copies made or distributed. It is advisable to send out a periodic request to departments/branches showing who is on the list and asking for any additions or corrections.
- Check all telephone numbers, persons named with particular responsibilities, equipment locations and availability. In addition, ask departments and agencies to review sections of the plan defining their responsibilities and actions.
- Distribute changes. Changes should be consecutively numbered for ease of tracking. Be specific ("Replace page ___ with the attached new page ___," or "cross out _______ on page ___ and write in the following (new phone number, name, location, etc.). Any key changes (i.e., emergency phone number change, equipment availability, etc.) should be distributed as soon as it occurs. Do not wait for the regular review period to notify plan holders.

- If practical, request an acknowledgement of changes from whomever you send them to. The best way to do this is to include a self-addressed send-back sheet ("I have received and entered changes dated __________. Signed __________").

- Attend any plan critique meetings and issue changes as may be required.

These periodic updates are the primary factor in continuing planning. Additional steps in continuing plan improvements are:

- Incident reviews and critiques. They are usually held after an accidental release to determine the plan's effectiveness. (Because acutely toxic chemical releases are very rare but extremely dangerous, the following two actions are more important than this one.)

- Exercises/tests. They put the plan into action by simulating incidents. From these tests the adequacy of the plan and personnel training and understanding of the plan can be evaluated.

- Training courses. They can better prepare organizations to perform their function when a release occurs.

6. CRITERIA FOR IDENTIFICATION OF ACUTELY TOXIC CHEMICALS

6.1 INTRODUCTION

This section is intended to assist communities in identifying those chemicals that could cause serious human health effects from short-term exposures such as accidental air releases. Such identification will be useful information for focusing initial efforts in the development of State and local contingency plans.

EPA has specified toxicity criteria that can be used to identify chemicals that would be of special concern if the public were exposed to such chemicals via accidental releases to the air. The identification of a chemical that meets the criteria does not in itself indicate the potential for serious human health effects in any release -- accidental or routine. Rather, such identification indicates a need for the community to undertake a program to investigate and evaluate the potential for accidental exposures associated with the production, storage or handling of the chemical at a particular site. Distinctions between this program and EPA's program for regulating routine releases of air toxics are stated in Chapter 1 of this guidance.

The assessment of potential risk following accidental release is based on an analysis of the chemical's toxicity coupled with an evaluation of possible exposure. Acutely toxic chemicals are identified by applying the criteria; the exposure assessment requires site-specific analysis of factors such as:

- Quantities of the chemicals produced, stored, or handled;
- The physical state of the chemical in storage or in the manufacturing process;
- The potential for interaction with other chemicals;
- The distance from potentially exposed populations; and
- The specific safety precautions currently employed.

In the following sections of this chapter the Agency's approach to identifying acutely toxic chemicals is described, numerical criteria are presented, and a method of applying the criteria to identify acutely toxic chemicals is described. Appendix A to this guidance presents a list of chemicals derived by applying the stated criteria to the Registry of Toxic Effects of Chemical Substances (RTECS) data base. Chemical profiles are included under separate cover. These profiles provide information on the listed chemicals that will be of use in developing contingency plans. Note that the list of identified chemicals is not inclusive; additional work will be needed by communities to identify chemicals in their environments that meet the criteria. The list is intended to be a starting point for further investigation. The end of this chapter directs communities to other hazardous chemicals that exist beyond the chemicals identified under these criteria.

6.2 APPROACH TO IDENTIFYING ACUTELY TOXIC CHEMICALS

EPA is concerned with identifying chemicals capable of producing serious health effects that are manifested either immediately or shortly after an acute exposure such as an accidental air release.

Unfortunately there is little information on the hazards to humans from chemical exposures. Therefore, the Agency has chosen to use data from animal species to infer effects in humans. The Agency assumes that humans and animals, on the average, are similar in intrinsic susceptibility. Since human populations are heterogeneous and individuals are expected to vary considerably in their sensitivity to chemical substances, the Agency has assumed that humans may be as sensitive as the most sensitive mammalian species tested.

Because complete toxicological profiles that present all potential concerns about the consequences of acute exposure are not uniformly available on chemicals, the Agency focused on the most commonly reported information from animal toxicity testing. Most frequently, data from acute toxicity testing have been expressed as the median lethal dose (LD_{50}) when the substance is taken by mouth or exposed to the skin, or median lethal concentration (LC_{50}) when the substance is inhaled. These data represent dose levels or concentrations of a chemical that will result in the death of 50 percent of the exposed test animals. In some cases, however, the acute toxicity test did not estimate an LD_{50} or LC_{50}; the only measure of lethality reported is the lowest dose or concentration at which some animals died (LD_{LO} or LC_{LO}). EPA has used the LD_{LO} or LC_{LO} data values if median values were not available for a chemical. The Agency chose to use LC_{LO} or LD_{LO} values in such circumstances in order to avoid incorrectly omitting highly toxic chemicals from consideration.

Another inconsistency among reported acute toxicity data involves the exposure duration for LC_{50} or LC_{LO} data from inhalation toxicity tests. In some cases exposure times have not been reported; where exposure times have been reported, they may vary from minutes to many hours. In using inhalation toxicity data, the Agency considered reported LC_{50} (or where necessary LC_{LO}) values for inhalation studies of up to 8 hours in duration as well as values for which times were not reported. The Agency chose to consider this range of studies in order to make the best use of available acute toxicity data.

6.3 CRITERIA

EPA has adopted the following criteria to identify acutely toxic chemicals based on data from mammalian testing:

Route	Acute Toxicity Measure	Value a/
Dermal	Median Lethal Dose (LD_{50})	Less than or equal to 50 mg/kg
Oral	Median Lethal Dose (LD_{50})	Less than or equal to 25 mg/kg
Inhalation	Median Lethal Concentration (LC_{50})	Less than or equal to 0.5 mg/l b/

a/ Criteria are to be matched against all mammalian test species evaluated for all chemicals.

b/ Where time of exposure is any time up to 8 hours.

NOTE: Where values for LD_{50} or LC_{50} data are lacking, but values for LD_{LO} or LC_{LO} are available for a particular chemical, the Agency recommends further investigation of the potential of that chemical (at a particular site) to pose a potential hazard when the LD_{LO} or LC_{LO} values fall within the selection criteria.

A chemical is identified as acutely toxic according to these criteria if mammalian acute toxicity data for any one of the three routes of administration fall below the value specified for that route.

These criteria are consistent with those used by the European Economic Community (EEC) and the World Bank (WB). EPA's criteria therefore recognize the precedent set by these two organizations, the similarity in policy goals, and the previous scientific opinions which established these criteria. EPA has modified the EEC/WB criteria in three ways: lethality data from the most sensitive mammalian species are included and not just those from rats; inhalation exposure time up to 8 hours is adopted instead of using only a 4-hour period; and LC_{LO} or LD_{LO} data are used when LD_{50} or LC_{50} are unavailable. The reasons for the modifications have been discussed in Section 6.2.

6.4 APPLICATION OF CRITERIA TO IDENTIFY AND LIST ACUTELY TOXIC CHEMICALS

The selection criteria can be applied to any data on chemical substances. The Agency applied the criteria to a specific toxicity data repository in order to develop an exemplary list of acutely toxic chemicals that may be of use to State or local groups. The National Institute of Occupational Health and Safety's Registry of Toxic Effects of Chemical Substances (RTECS), was selected because it is the largest computerized set of acute toxicity data available. EPA recognizes the limitations of using RTECS. The data in this system, in general, are of variable quality, have not been subjected to scientific scrutiny for adequacy, and have not been systematically screened for errors upon entry. Therefore, it is often difficult to know the degree of confidence that should be placed on the values listed. Nevertheless, due to the impracticability of attempting to access and review copies of all acute toxicity literature relevant to this project, the EPA is relying on the values in RTECS while keeping in mind their limitations. It is expected that more appropriate information on the toxicity of a chemical may be available from the manufacturer.

EPA selected only those chemicals in current production by referring to the 1977 TSCA inventory and the current EPA list of active pesticide ingredients. Chemicals placed on the TSCA inventory since 1977 (i.e., premanufacturing notice chemicals) also have been reviewed and included on the list if they meet the criteria.

EPA made additional efforts to check that chemicals included on its initial list are in production. If EPA staff had no direct knowledge that a chemical was in production, they checked recent literature and published reports. Where literature and published reports were lacking or out-of-date, EPA confirmed production through contacts with manufacturers, suppliers, or users. If production was not confirmed, the chemical is so noted on the list.

The criteria values selected are for "very toxic" chemicals. Chemicals with acute lethality values above the criteria values are not necessarily safe. In fact, many are still toxic and may be threats to the community in an accident situation. EPA has listed some of these chemicals based on large production and acute lethality values as explained on the list of these "Other Acutely Toxic Chemicals" in Appendix A.

Chemicals only used as food, drugs, or cosmetics and radioactive chemicals not listed on the TSCA inventory were not screened for acute toxicity. These chemicals are regulated by other agencies. Also, chemicals in a research and development stage not listed on the TSCA inventory were not screened for acute toxicity. If these research chemicals go into production, EPA will identify and list such chemicals through its premanufacture review notice program.

Hazards from chemicals are not limited to chemicals identified under this criteria. There are many explosive, flammable, reactive, and corrosive chemicals that may warrant consideration in emergency preparedness and response planning. Communities should consult the criteria and list of chemicals in Department of Transportation (DOT) regulations found in 49 CFR 172.101 for explosive, flammable, reactive, and corrosive chemicals.

Following is a list of criteria for explosive, flammable, reactive, and corrosive chemicals (all section citations are to 49 CFR Part 173).

Class A Explosive	Detonating or otherwise of maximum hazard. The nine types of Class A explosives are defined in Sec. 173.53.
Class B Explosive	Flammable hazard - In general, functions by rapid burning rather than detonation. Includes some explosive devices such as special fireworks, flash powders, etc. (Sec. 173.88)
Class C Explosive	Minimum hazard - Certain types of fireworks and certain types of manufactured articles containing restricted quantities of Class A and/or Class B explosives as components. (Sec. 173.100)
Blasting Agent	A material designed for blasting which has been tested in accordance with Sec. 173.114a(b). It must be so insensitive that there is very little probability of: (1) accidental explosion or (2) going from burning to detonation. (Sec. 173.114a(b))
Gases (basic definition)	Compressed Gas - Any material or mixture having in-the-container a pressure EXCEEDING 40 psia at 70°F, OR a pressure exceeding 104 psia at 130°F; or any liquid flammable material having a vapor pressure exceeding 40 psia at 100°F. (Sec. 173.300(a)) Non-liquefied compressed gas is a gas (other than gas in solution) which, under the charged pressure, is entirely gaseous at a temperature of 70°F. Liquefied compressed gas is a gas which, under the charged pressure, is partially liquid at a temperature of 70°F.
Flammable Gas	Any compressed gas meeting criteria as specified in Sec. 173.300(b). This includes: lower flammability limit, flammability limit range, flame projection, or flame propagation.
Nonflammable Gas	Any compressed gas other than a flammable compressed gas.
Combustible Liquid	Any liquid having a flash point at or above 100°F and below 200°F. Authorized flash point methods are listed in Sec. 173.115(d). Exceptions are found in Sec. 173.115(b).
Flammable Liquid	Any liquid having a flash point below 100°F. Authorized flash point methods are listed in Sec. 173.115(d). For exceptions, see Sec. 173.115(a).

	Pyroforic Liquid - Any liquid that ignites spontaneously in dry or moist air at or below 130°F. (Sec. 173.115(c))
Flammable Solid	Any solid material (other than an explosive) which is liable to cause fires through friction or retained heat from manufacturing or processing. It can be ignited readily and burns so vigorously and persistently, as to create a serious transportation hazard. Included in this class are spontaneously combustible and water-reactive materials. (Sec. 173.150))
	Spontaneously Combustible Material (Solid) - A solid substance (including sludges and pastes) which may undergo spontaneous heating or self-burning under normal transportation conditions. These materials may increase in temperature and ignite when exposed to air. (Sec. 171.8)
	Water Reactive Material (Solid) - Any solid substance (including sludges and pastes) which react with water by igniting or giving off dangerous quantities of flammable or toxic gases. (Sec. 171.8)
Organic Peroxide	An organic compound containing the bivalent -0-0 structure. It may be considered a derivative of hydrogen peroxide where one or more of the hydrogen atoms have been replaced by organic radicals. It must be classed as an organic peroxide unless it meets certain criteria listed in Sec. 173.151(a).
Oxidizer	A substance such as chlorate, permanganate, inorganic peroxide, or a nitrate, that yields oxygen readily. It accelerates the combustion of organic matter. (See Sec. 173.151)
Poison A	Extremely Dangerous Poisons - Poisonous gases or liquids -- a very small amount of the gas, or vapor of the liquid, mixed with air is dangerous to life. (Sec. 173.326)
Poison B	Less Dangerous Poisons - Substances, liquids or solids (including pastes and semi-solids), other than Class A or Irritating materials -- so toxic (or presumed to be toxic) to man that they are a hazard to health during transportation. (Sec. 173.381)
Corrosive Material	Any liquid or solid that causes visible destruction or irreversible damage to human skin tissue. Also, it may be a liquid that has a severe corrosion rate on steel. (See Sec. 173.240(a) and (b) for details)

There are also a number of substances identified in the DOT regulations as "Forbidden" (49 CFR 172.101). While these materials may not be offered for transportation, they may be present in facilities as components of manufacturing, storage, or handling. These materials should be considered in assessing the risks associated with the operation of the facility. In addition, DOT specifies useful criteria for assessing unstable materials in 49 CFR 173.21 and 173.51.

The chemicals described above may create problems when stored or used near other chemicals which could be affected or even released in the event of an explosion, fire, reaction, or rupture due to corrosion. Communities are advised to consider all chemicals that meet the DOT criteria as opposed to relying on the DOT list exclusively. The DOT list typically only includes chemicals that may be transported and as such may not include intermediates or other chemicals that are explosive, flammable, reactive, or corrosive that may never be transported off a site.

Note also that DOT has criteria and a list of chemicals identified as poisons A and B. Chemicals in these categories are subject to DOT regulations for transportation. All DOT poisons A and B may not be identified under EPA's criteria for acutely toxic chemicals because EPA's criteria are for "very" toxic chemicals and as such do not identify every toxic chemical that may need to be regulated in transportation or any other activity. EPA has identified "very" toxic chemicals to provide a focus for initial efforts in community emergency preparedness and response planning. Therefore, criteria are not provided that would identify every chemical that may be acutely toxic to human beings.

APPENDIX A

ACUTELY TOXIC CHEMICALS

A.1 ACUTELY TOXIC CHEMICALS

This appendix contains the list of chemicals identified by EPA for which an acute toxicity measure has a value meeting the criteria stated in Chapter 6. These very toxic chemicals are listed alphabetically by common chemical name. The corresponding Chemical Abstract Service (CAS) number is provided for each name. There are 379 chemicals on the list.

Following the CAS Number list are two indices of the multiple names used for each acutely toxic chemical. The first index lists the common chemical name, the CAS name if different from the common name, and some synonyms for each chemical. All names on the first index are in alphabetical order. The CAS number is listed for each name on this index. Synonyms were selected by EPA on the basis of common use. The second index lists in CAS number order all names on the indices.

Long names for chemicals on all lists are truncated. Where the complete name is truncated, three dots follow the last character of the name.

Some of the acutely toxic chemicals have been identified through EPA's Premanufacture Notice (PMN) program for new chemicals. Information on some of these PMN chemicals cannot be published because of requirements for EPA to maintain confidential business information (CBI) restrictions. Such PMN chemicals are listed by their PMN number. The index contains the PMN number and a non-CBI generic name for one such chemical.

One hundred forty-one chemicals names are preceded by an asterisk. The asterisk identifies chemicals that EPA could not verify as being manufactured or imported for commercial purposes as defined in the Toxic Substances Control Act or as being manufactured as a pesticide within the three years prior to October 1, 1985. Verification of commercialization was performed by an EPA expert panel. Production was verified if the panel:

1. Recalled published information that the candidate is in commercial production; or

2. Recalled recent advertisements or promotional materials which substantiate commercial production; or

3. Recalled name(s) of one or more manufacturers, importers, processors, or users; or

4. Identified listings in Chemical Marketing Reporter, Chemical & Engineering News, Chemical Week, SRI International's Chemical Economics Handbook, or other publications or data bases: or

5. Contacted manufacturers, importers, suppliers, processors, or users who confirmed manufacture or importation since October 1, 1982; or

6. Confirmed Notice of Commencement of manufacture was received by EPA on or since October 1, 1982.

A.2 OTHER CHEMICALS

In addition to the identification of the acutely toxic chemicals meeting the criteria stated in Chapter 6, EPA has identified some other chemicals which, because of their high production capacity combined with their acute toxicity, should be considered as chemicals of concern to emergency preparedness and response planning. A list of these chemicals entitled, "Other Chemicals" follows the index.

These other chemicals were selected by the following process.

1. Identify other chemical candidates from the high production capacity chemicals listed in the SRI International publication, 1985 Directory of Chemical Producers, United States of America, pp. 388-389 or from the World Bank list Group B: Other Toxic Substances.

2. From the candidates identified in 1 above, select for listing chemicals whose acute toxicity measures have values equal to the World Bank and European Community criteria for other toxic substances. These criteria are:

Dermal	Median Lethal Dose (LD_{50})	Less than or equal to 400 mg/kg
	or	
Oral	Median Lethal Dose (LD_{50})	Less than or equal to 200 mg/kg
	or	
Inhalation	Median Lethal Concentration (LC_{50})	Less than or equal to 2 mg/L

The data selection rules described in Chapter 6 were used.

Phosgene, bromine, and carbon disulfide do not have acute toxicity measures that strictly meet the criteria stated in 2 above. However, based on production capacity, known danger, and identification of the chemicals as other toxic substances by the World Bank and European Community these chemicals are placed on the list of "Other Chemicals."

It should be emphasized that a number of chemicals on the list of Other Chemicals are widely used in commerce with little danger of serious accidents resulting in acute toxic effects. For example, solutions of hydrogen peroxide are commonly found in peoples' medicine cabinets and when used properly present little potential for toxic effects. However, where large volumes of concentrated substance are handled, accidental release would be of concern. This emphasizes the need to apply the site specific guidance in determining whether the material is of concern for emergency preparedness planning.

A.3 CHEMICAL PROFILES

For each acutely toxic chemical and each other chemical listed an EPA Chemical Profile was prepared and is available from EPA. An EPA Chemical Profile is a collection of information on the chemical identity, hazardous identity, physical/chemical characteristics, fire and explosion hazard, reactivity, health hazard, use, and precautions for handling and use of the chemical. The information is presented in the format that conforms as closely as possible to the Occupational Safety and Health Administration (OSHA) recommended format for a Material Safety Data Sheet (MSDS). An EPA Chemical Profile follows.

EPA CHEMICAL PROFILE

Date: October 9, 1985
Revision:

CHEMICAL IDENTITY -- ISOPROPYL CHLOROFORMATE

CAS Registry Number: 108-23-6

Synonyms: Carbonochloride Acid, 1-Methylethyl Ester; Carbonochloridic Acid, 1-Methylethyl Ester; Chloroformic Acid Isopropyl Ester; Formic Acid, Chloro-, Isopropyl Ester; Isopropyl Chlorocarbonate; Isopropyl Chloromethanoate

Chemical Formula: $C_4H_7ClO_2$

Molecular Weight: 122.55

SECTION I -- HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

OSHA PEL: Not Found

ACGIH TLV: Not Found

IDLH: Not Found

Other Limits Recommended: Toxicity information: LC_{low} inhalation (rat) 1 mg/liter/5 hours (*NIOSH/RTECS 1985)

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: 220°F, 104.6°C at 761 mmHg (*Weast 1979)

Specific Gravity (H_2O=1): 1.08 (*Patty 1963)

Vapor Pressure (mmHg): Not Found

Melting Point: Not Found

Vapor Density (AIR=1): 4.2 (*Patty 1963)

Evaporation Rate (Butyl acetate=1): Not Found

Solubility in Water: Insoluble in water (*Weast 1979)

Appearance and Odor: Colorless liquid (*Hawley 1977)

ISOPROPYL CHLOROFORMATE

SECTION III -- FIRE AND EXPLOSION HAZARD DATA

Flash Point (Method Used): 60.1°F, 15.6°C (*Clayton and Clayton 1981-1982)
Flammable Limits: Flammable; may be ignited by heat, sparks or flame (DOT 1984, Guide 29)
LEL: Not Found
UEL: Not Found

Extinguishing Methods: Keep unnecessary people away and isolate hazard area. Stay upwind and keep out of low areas. Wear self-contained (positive pressure if available) breathing apparatus and full protective clothing. For small fires, use dry chemical, carbon dioxide, water spray or foam. For large fires, use water spray, fog or foam. Do not get water inside container. Cool containers exposed to flame with water until well after fire is out. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire (DOT 1984, Guide 29).

Special Fire Fighting Procedures: Isolate for 1/2 mile in all directions if tank car or truck is involved in fire (DOT 1984, Guide 29).

Unusual Fire and Explosion Hazards: Extremely dangerous; this chemical has exploded while stored in refrigerator (*Sax 1979). Vapor explosion hazard indoors, outdoors or in sewers. Runoff to sewer may create fire or explosion hazard (DOT 1984, Guide 29).

SECTION IV -- REACTIVITY DATA

Stability: **Unstable**: Yes (*Patty 1963)
Stable:

Conditions to Avoid: Avoid phosgene (*Sax 1979)

Incompatibility (Materials to Avoid): Reacts violently with phosgene (*Sax 1979).

Hazardous Decomposition or Byproducts: It is corrosive and hydrolyzes in the presence of water or moist air (*Patty 1963).

Hazardous Polymerization: **May Occur**: Not Found
May Not Occur: Not Found

Conditions to Avoid: Not Found

ISOPROPYL CHLOROFORMATE

SECTION V -- HEALTH HAZARD DATA

Routes of Entry: **Inhalation:** Yes (Sax 1984, p. 1657)
Skin: Yes (Sax 1984, p. 1657)
Ingestion: Yes (Sax 1979, p. 1657)

Health Hazards (Acute, Delayed, and Chronic): Acute: highly toxic by inhalation, ingestion and skin absorption (Sax 1984, p. 1657). Delayed: can produce delayed pulmonary edema (2-24 hours after exposure) similar to that produced by phosgene (*Patty 1963; *Rumack 1975 to Present). Inhalation of material may cause death or permanent injury (*Sax 1979).

Signs and Symptoms of Exposure: Eye irritation, irritation of upper respiratory tract and surface burns have been observed. Eye irritation may persist after exposure ceases, and skin sensitization may occur (*Patty 1963). Inhalation exposures at elevated concentrations cause death by immediate lung damage, lower concentrations cause difficult breathing, collapse, and convulsions (Clayton and Clayton 1981-1982, p. 2390).

Medical Conditions Generally Aggravated by Exposure: Not Found

Emergency and First Aid Procedures: Move victim to fresh air. Obtain emergency medical care immediately. Remove and isolate contaminated clothing and shoes at the site. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes (DOT 1984, Guide 29).

SECTION VI -- USE INFORMATION

Used as a chemical intermediate for free-radical polymerization initiators and in organic synthesis (*Hawley 1977).

SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE
(Steps to be Taken in Case Material is Released or Spilled)

In case of spills or leaks, shut off ignition sources and keep away flares, smoking or flames. Do not touch spilled material. Use water to reduce vapors but do not get water inside containers. Take up small spills with sand or other noncombustible absorbent material and place in containers for later disposal. For large spills, dike far ahead of spill for later disposal (DOT 1984, Guide 29).

Acutely Toxic Chemicals
Alphabetic List of Common Names and CAS Numbers

Common Name	CAS Number
Acetone cyanohydrin	00075-86-5
* Acetone thiosemicarbazide	01752-30-3
Acrolein	00107-02-8
Acrylyl chloride	00814-68-6
Aldicarb	00116-06-3
Aldrin	00309-00-2
Allyl alcohol	00107-18-6
Allylamine	00107-11-9
Aluminum phosphide	20859-73-8
* Aminopterin	00054-62-6
* Amiton	00078-53-5
* Amiton oxalate	03734-97-2
Ammonium chloroplatinate	16919-58-7
* Amphetamine	00300-62-9
* Aniline, 2,4,6-trimethyl-	00088-05-1
Antimony pentafluoride	07783-70-2
* Antimycin A	01397-94-0
Antu	00086-88-4
* Arsenic pentoxide	01303-28-2
Arsenous oxide	01327-53-3
Arsenous trichloride	07784-34-1
Arsine	07784-42-1
* Azinphos-ethyl	02642-71-9
Azinphos-methyl	00086-50-0
* Bacitracin	01405-87-4
Benzal chloride	00098-87-3
Benzenamine, 3-(trifluoromethyl)-	00098-16-8
Benzene, 1-(chloromethyl)-4-nitro-	00100-14-1
* Benzenearsonic acid	00098-05-5
Benzenesulfonyl chloride	00098-09-9
Benzotrichloride	00098-07-7
Benzyl chloride	00100-44-7
Benzyl cyanide	00140-29-4
* Bicyclo[2.2.1]heptane-2-carbonitrile, 5-chloro...	15271-41-7
* Bis(chloromethyl) ketone	00534-07-6
* Bitoscanate	04044-65-9
Boron trichloride	10294-34-5
Boron trifluoride	07637-07-2
Boron trifluoride compound with methyl ether (1:1)	00353-42-4
Bromadiolone	28772-56-7
Butadiene	00106-99-0
Butyl isovalerate	00109-19-3
Butyl vinyl ether	00111-34-2
C.I. basic green 1	00633-03-4
Cadmium oxide	01306-19-0
Cadmium stearate	02223-93-0
Calcium arsenate	07778-44-1
Camphechlor	08001-35-2
* Cantharidin	00056-25-7
* Carbachol chloride	00051-83-2

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Common Name	CAS Number
* Carbamic acid, methyl-, O-[[(2,4-dimethyl...	26419-73-8
Carbofuran	01563-66-2
Carbophenothion	00786-19-6
Carvone	02244-16-8
* Chlordane	00057-74-9
Chlorfenvinfos	00470-90-6
Chlorine	07782-50-5
* Chlormephos	24934-91-6
Chlormequat chloride	00999-81-5
Chloroacetaldehyde	00107-20-0
Chloroacetic acid	00079-11-8
Chloroethanol	00107-07-3
* Chloroethyl chloroformate	00627-11-2
Chloromethyl ether	00542-88-1
* Chloromethyl methyl ether	00107-30-2
Chlorophacinone	03691-35-8
* Chloroxuron	01982-47-4
* Chlorthiophos	21923-23-9
Chromic chloride	10025-73-7
Cobalt	07440-48-4
Cobalt carbonyl	10210-68-1
* Cobalt, [[2,2'-[1,2-ethanediylbis(nitrilomethy...	62207-76-5
* Colchicine	00064-86-8
Coumafuryl	00117-52-2
Coumaphos	00056-72-4
* Coumatetralyl	05836-29-3
Cresylic acid	00095-48-7
* Crimidine	00535-89-7
Crotonaldehyde	00123-73-9
Crotonaldehyde	04170-30-3
Cyanogen bromide	00506-68-3
Cyanogen iodide	00506-78-5
* Cyanophos	02636-26-2
Cyanuric fluoride	00675-14-9
Cycloheximide	00066-81-9
Cyclopentane	00287-92-3
Decaborane(14)	17702-41-9
Demeton	08065-48-3
* Demeton-S-methyl	00919-86-8
* Dialifos	10311-84-9
Diborane	19287-45-7
Dibutyl phthalate	00084-74-2
Dichlorobenzalkonium chloride	08023-53-8
Dichloroethyl ether	00111-44-4
Dichloromethylphenylsilane	00149-74-6
Dichlorvos	00062-73-7
Dicrotophos	00141-66-2
Diepoxybutane	01464-53-5
Diethyl chlorophosphate	00814-49-3
Diethyl-p-phenylenediamine	00093-05-0

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Common Name	CAS Number
* Diethylcarbamazine citrate	01642-54-2
* Digitoxin	00071-63-6
Diglycidyl ether	02238-07-5
* Digoxin	20830-75-5
* Dimefox	00115-26-4
Dimethoate	00060-51-5
Dimethyl phosphorochloridothioate	02524-03-0
Dimethyl phthalate	00131-11-3
Dimethyl sulfate	00077-78-1
Dimethyl sulfide	00075-18-3
Dimethyl-p-phenylenediamine	00099-98-9
Dimethyldichlorosilane	00075-78-5
Dimethylhydrazine	00057-14-7
* Dimetilan	00644-64-4
Dinitrocresol	00534-52-1
Dinoseb	00088-85-7
* Dinoterb	01420-07-1
Dioctyl phthalate	00117-84-0
Dioxathion	00078-34-2
Dioxolane	00646-06-0
Diphacinone	00082-66-6
Diphosphoramide, octamethyl-	00152-16-9
Disulfoton	00298-04-4
Dithiazanine iodide	00514-73-8
* Dithiobiuret	00541-53-7
EPN	02104-64-5
* Emetine, dihydrochloride	00316-42-7
Endosulfan	00115-29-7
* Endothion	02778-04-3
Endrin	00072-20-8
* Ergocalciferol	00050-14-6
* Ergotamine tartrate	00379-79-3
* Ethanesulfonyl chloride, 2-chloro-	01622-32-8
* Ethanol, 1,2-dichloro-, acetate	10140-87-1
Ethion	00563-12-2
Ethoprophos	13194-48-4
* Ethyl thiocyanate	00542-90-5
* Ethylbis(2-chloroethyl)amine	00538-07-8
* Ethylene fluorohydrin	00371-62-0
Ethylenediamine	00107-15-3
Ethyleneimine	00151-56-4
* Ethylmercuric phosphate	02235-25-8
Fenamiphos	22224-92-6
Fenitrothion	00122-14-5
Fensulfothion	00115-90-2
* Fluenetil	04301-50-2
Fluorine	07782-41-4
Fluoroacetamide	00640-19-7
* Fluoroacetic acid	00144-49-0
Fluoroacetyl chloride	00359-06-8

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Common Name	CAS Number
* Fluorouracil	00051-21-8
Fonofos	00944-22-9
Formaldehyde cyanohydrin	00107-16-4
* Formetanate	23422-53-9
* Formothion	02540-82-1
* Formparanate	17702-57-7
* Fosthietan	21548-32-3
* Fuberidazole	03878-19-1
Furan	00110-00-9
Gallium trichloride	13450-90-3
Hexachlorocyclopentadiene	00077-47-4
* Hexachloronaphthalene	01335-87-1
Hexamethylenediamine, N,N'-dibutyl-	04835-11-4
Hydrazine	00302-01-2
Hydrocyanic acid	00074-90-8
Hydrogen fluoride	07664-39-3
Hydrogen selenide	07783-07-5
* Indomethacin	00053-86-1
Iridium tetrachloride	10025-97-5
Iron, pentacarbonyl-	13463-40-6
* Isobenzan	00297-78-9
Isobutyronitrile	00078-82-0
Isocyanic acid, 3,4-dichlorophenyl ester	00102-36-3
* Isodrin	00465-73-6
* Isofluorphate	00055-91-4
Isophorone diisocyanate	04098-71-9
Isopropyl chloroformate	00108-23-6
* Isopropyl formate	00625-55-8
* Isopropylmethylpyrazolyl dimethylcarbamate	00119-38-0
Lactonitrile	00078-97-7
* Leptophos	21609-90-5
* Lewisite	00541-25-3
* Lindane	00058-89-9
Lithium hydride	07580-67-8
Malononitrile	00109-77-3
Manganese, tricarbonyl methylcyclopentadienyl	12108-13-3
* Mechlorethamine	00051-75-2
* Mephosfolan	00950-10-7
Mercuric acetate	01600-27-7
Mercuric chloride	07487-94-7
Mercuric oxide	21908-53-2
Mesitylene	00108-67-8
* Methacrolein diacetate	10476-95-6
* Methacrylic anhydride	00760-93-0
Methacrylonitrile	00126-98-7
Methacryloyl chloride	00920-46-7
Methacryloyloxyethyl isocyanate	30674-80-7
Methamidophos	10265-92-6
* Methanesulfonyl fluoride	00558-25-8
* Methidathion	00950-37-8

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Common Name	CAS Number
Methiocarb	02032-65-7
Methomyl	16752-77-5
* Methoxyethylmercuric acetate	00151-38-2
Methyl 2-chloroacrylate	00080-63-7
Methyl chloroformate	00079-22-1
Methyl disulfide	00624-92-0
Methyl isocyanate	00624-83-9
* Methyl isothiocyanate	00556-61-6
Methyl mercaptan	00074-93-1
* Methyl phenkapton	03735-23-7
Methyl phosphonic dichloride	00676-97-1
* Methyl thiocyanate	00556-64-9
Methyl vinyl ketone	00078-94-4
Methylhydrazine	00060-34-4
* Methylmercuric dicyanamide	00502-39-6
Methyltrichlorosilane	00075-79-6
* Metolcarb	01129-41-5
* Mevinphos	07786-34-7
* Mexacarbate	00315-18-4
* Mitomycin C	00050-07-7
Monocrotophos	06923-22-4
* Muscimol	02763-96-4
* Mustard gas	00505-60-2
Nickel	07440-02-2
Nickel carbonyl	13463-39-3
Nicotine	00054-11-5
* Nicotine sulfate	00065-30-5
Nitric acid	07697-37-2
Nitric oxide	10102-43-9
* Nitrocyclohexane	01122-60-7
Nitrogen dioxide	10102-44-0
Nitrosodimethylamine	00062-75-9
* Norbormide	00991-42-4
* Organorhodium complex	PMN-82-147
* Orotic acid	00065-86-1
Osmium tetroxide	20816-12-0
* Ouabain	00630-60-4
Oxamyl	23135-22-0
Oxetane, 3,3-bis(chloromethyl)	00078-71-7
* Oxydisulfoton	02497-07-6
Ozone	10028-15-6
Paraquat	01910-42-5
* Paraquat methosulfate	02074-50-2
Parathion	00056-38-2
Parathion-methyl	00298-00-0
Paris green	12002-03-8
* Pentaborane	19624-22-7
Pentachloroethane	00076-01-7
Pentachlorophenol	00087-86-5
* Pentadecylamine	02570-26-5

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Common Name	CAS Number
Peracetic acid	00079-21-0
Perchloromethylmercaptan	00594-42-3
* Phenarsazine oxide	00058-36-6
Phenol	00108-95-2
* Phenol, 2,2'-thiobis(4-chloro-6-methyl-	04418-66-0
Phenol, 2,2'-thiobis[4,6-dichloro-	00097-18-7
* Phenol, 3-(1-methylethyl)-, methylcarbamate	00064-00-6
* Phenyl dichloroarsine	00696-28-6
Phenylhydrazine hydrochloride	00059-88-1
Phenylmercury acetate	00062-38-4
Phenylsilatrane	02097-19-0
* Phenylthiourea	00103-85-5
Phorate	00298-02-2
* Phosacetim	04104-14-7
* Phosfolan	00947-02-4
Phosmet	00732-11-6
Phosphamidon	13171-21-6
Phosphine	07803-51-2
* Phosphonothioic acid, methyl-, O-(4-nitrophenyl...	02665-30-7
* Phosphonothioic acid, methyl-, O-ethyl O-[4-...	02703-13-1
* Phosphonothioic acid, methyl-, S-[2-[bis...	50782-69-9
* Phosphoric acid, dimethyl 4-(methylthio)phenyl...	03254-63-5
Phosphorous trichloride	07719-12-2
Phosphorus	07723-14-0
Phosphorus oxychloride	10025-87-3
Phosphorus pentachloride	10026-13-8
Phosphorus pentoxide	01314-56-3
* Phylloquinone	00084-80-0
* Physostigmine	00057-47-6
* Physostigmine, salicylate (1:1)	00057-64-7
* Picrotoxin	00124-87-8
Piperidine	00110-89-4
* Piprotal	05281-13-0
* Pirimifos-ethyl	23505-41-1
Platinous chloride	10025-65-7
Platinum tetrachloride	13454-96-1
* Potassium arsenite	10124-50-2
Potassium cyanide	00151-50-8
Potassium silver cyanide	00506-61-6
* Promecarb	02631-37-0
Propargyl bromide	00106-96-7
Propiolactone, .beta.-	00057-57-8
Propionitrile	00107-12-0
* Propionitrile, 3-chloro-	00542-76-7
Propyl chloroformate	00109-61-5
Propylene glycol, allyl ether	01331-17-5
Propyleneimine	00075-55-8
* Prothoate	02275-18-5
Pseudocumene	00095-63-6
Pyrene	00129-00-0

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Common Name	CAS Number
Pyridine, 2-methyl-5-vinyl-	00140-76-1
Pyridine, 4-amino-	00504-24-5
* Pyridine, 4-nitro-, 1-oxide	01124-33-0
* Pyriminil	53558-25-1
Rhodium trichloride	10049-07-7
* Salcomine	14167-18-1
* Sarin	00107-44-8
* Selenium oxychloride	07791-23-3
Selenous acid	07783-00-8
Semicarbazide hydrochloride	00563-41-7
Silane, (4-aminobutyl)diethoxymethyl-	03037-72-7
* Sodium anthraquinone-1-sulfonate	00128-56-3
Sodium arsenate	07631-89-2
Sodium arsenite	07784-46-5
Sodium azide (Na(N3))	26628-22-8
Sodium cacodylate	00124-65-2
Sodium cyanide (Na(CN))	00143-33-9
Sodium fluoroacetate	00062-74-8
Sodium pentachlorophenate	00131-52-2
* Sodium selenate	13410-01-0
Sodium selenite	10102-18-8
* Sodium tellurite	10102-20-2
Strychnine	00057-24-9
Strychnine, sulfate	00060-41-3
Sulfotep	03689-24-5
* Sulfoxide, 3-chloropropyl octyl	03569-57-1
Sulfur tetrafluoride	07783-60-0
Sulfur trioxide	07446-11-9
Sulfuric acid	07664-93-9
* TEPP	00107-49-3
* Tabun	00077-81-6
Tellurium	13494-80-9
Tellurium hexafluoride	07783-80-4
Terbufos	13071-79-9
Tetraethyllead	00078-00-2
* Tetraethyltin	00597-64-8
Tetranitromethane	00509-14-8
Thallic oxide	01314-32-5
* Thallous carbonate	06533-73-9
Thallous chloride	07791-12-0
* Thallous malonate	02757-18-8
* Thallous sulfate	07446-18-6
* Thallous sulfate	10031-59-1
* Thiocarbazide	02231-57-4
Thiocyanic acid, (2-benzothiazolylthio)methyl...	21564-17-0
* Thiofanox	39196-18-4
* Thiometon	00640-15-3
* Thionazin	00297-97-2
Thiophenol	00108-98-5
Thiosemicarbazide	00079-19-6

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Common Name	CAS Number
* Thiourea, (2-chlorophenyl)-	05344-82-1
* Thiourea, (2-methylphenyl)-	00614-78-8
Titanium tetrachloride	07550-45-0
Toluene 2,4-diisocyanate	00584-84-9
Toluene 2,6-diisocyanate	00091-08-7
* Triamiphos	01031-47-6
* Triazofos	24017-47-8
Trichloro(chloromethyl)silane	01558-25-4
Trichloro(dichlorophenyl)silane	27137-85-5
Trichloroacetyl chloride	00076-02-8
Trichloroethylsilane	00115-21-9
* Trichloronate	00327-98-0
Trichlorophenylsilane	00098-13-5
Trichlorphon	00052-68-6
Triethoxysilane	00998-30-1
Trimethylchlorosilane	00075-77-4
* Trimethylolpropane phosphite	00824-11-3
Trimethyltin chloride	01066-45-1
Triphenyltin chloride	00639-58-7
* Tris(2-chloroethyl)amine	00555-77-1
Valinomycin	02001-95-8
Vanadium pentoxide	01314-62-1
Vinylnorbornene	03048-64-4
Warfarin	00081-81-2
Warfarin sodium	00129-06-6
Xylylene dichloride	28347-13-9
Zinc phosphide	01314-84-7
* Zinc, dichloro[4,4-dimethyl-5-[[[(methylamino)...	58270-08-9
trans-1,4-Dichlorobutene	00110-57-6

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Names	CAS Number
(+-)-Desoxynorephedrine	00300-62-9
.beta.,.beta.'-Dichloroethyl sulfide	00505-60-2
.beta.-Chloroethanesulfonyl chloride	01622-32-8
.gamma.-Benzene hexachloride	00058-89-9
.psi.-Cumene	00095-63-6
1,1-Dimethylhydrazine	00057-14-7
1,2-Benzenedicarboxylic acid, dibutyl ester	00084-74-2
1,2-Benzenedicarboxylic acid, dimethyl ester	00131-11-3
1,2-Benzenedicarboxylic acid, dioctyl ester	00117-84-0
1,2-Diaminoethane	00107-15-3
1,2-Dichloroethyl acetate	10140-87-1
1,2-Ethanediamine	00107-15-3
1,3,5-Triazine, 2,4,6-trifluoro-	00675-14-9
1,3-Benzodioxole, 5-[bis[2-(2-butoxyethoxy)ethoxy]methyl]-	05281-13-0
1,3-Butadiene	00106-99-0
1,3-Cyclopentadiene, 1,2,3,4,5,5-hexachloro-	00077-47-4
1,3-Dichloroacetone	00534-07-6
1,3-Dioxolane	00646-06-0
1,3-Dithiolane-2-carboxaldehyde, 2,4-dimethyl-, O-(methylcarbamoyl)oxime	26419-73-8
1,3-Indandione, 2-[(p-chlorophenyl)phenylacetyl]-	03691-35-8
1,3-Indandione, 2-diphenylacetyl-	00082-66-6
1,3-Propanediol, 2-ethyl-2-(hydroxymethyl)-, cyclic phosphite (1:1)	00824-11-3
1,4-Benzenediamine, N,N-diethyl-	00093-05-0
1,4-Benzenediamine, N,N-dimethyl-	00099-98-9
1,4-Naphthalenedione, 2-methyl-3-(3,7,11,15-tetramethyl-2-hexadecenyl)-, [R-[...	00084-80-0
1,4:5,8-Dimethanonaphthalene, 1,2,3,4,10,10-hexachloro-1,4,4a,5,8,8a-hexahydr...	00309-00-2
1,4:5,8-Dimethanonaphthalene, 1,2,3,4,10,10-hexachloro-1,4,4a,5,8,8a-hexahydr...	00465-73-6
1,4:5,8-Dimethanonaphthalene, 1,2,3,4,10,10-hexachloro-6,7-epoxy-1,4,4a,5,6,7...	00072-20-8
1,6-Hexanediamine, N,N'-dibutyl-	04835-11-4
1-Amino-2-thiourea	00079-19-6
1-Aminopentadecane	02570-26-5
1-Anthracenesulfonic acid, 9,10-dihydro-9,10-dioxo-, sodium salt	00128-56-3

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Names	CAS Number
1-Butanamine, 4-(diethoxymethylsilyl)-	03037-72-7
1-Buten-3-one	00078-94-4
1-Naphthylthiourea	00086-88-4
1-Pentadecanamine	02570-26-5
1-Phenyl-1,2,4-triazolyl-3-(O,O-diethyl thionophosphate)	24017-47-8
1-Phenyl-3-(O,O-diethyl thionophosphoryl)-1,2,4-triazole	24017-47-8
1-Piperazinecarboxamide, N,N-diethyl-4-methyl-, 2-hydroxy-1,2,3-propanetricar...	01642-54-2
1-Piperazinecarboxamide, N,N-diethyl-4-methyl-, citrate (1:1)	01642-54-2
1-Propyne, 3-bromo-	00106-96-7
10H-Phenoxarsine, 10,10'-oxybis-	00058-36-6
1H-Benzimidazole, 2-(2-furanyl)-	03878-19-1
1H-Indene-1,3(2H)-dione, 2-(diphenylacetyl)-	00082-66-6
1H-Indene-1,3(2H)-dione, 2-[(4-chlorophenyl)phenylacetyl]-	03691-35-8
1H-Indole-3-acetic acid, 1-(4-chlorobenzoyl)-5-methoxy-2-methyl-	00053-86-1
2,2'-Bioxirane	01464-53-5
2,4(1H,3H)-Pyrimidinedione, 5-fluoro-	00051-21-8
2,4-Dinitro-6-tert-butylphenol	01420-07-1
2,4-TDI	00584-84-9
2,6,7-Trioxa-1-phosphabicyclo[2.2.2]octane, 4...	00824-11-3
2,6-Piperidinedione, 4-[2-(3,5-dimethyl-2-oxocyclohexyl)-2-hydroxyethyl...	00066-81-9
2,6-TDI	00091-08-7
2,7:3,6-Dimethanonaphth[2,3-b]oxirene, 3,4,5,6,9,9-hexachloro-1a,2,2a,3,6,6a,...	00072-20-8
2,8,9-Trioxa-5-aza-1-silabicyclo[3.3.3]undecane, 1-phenyl-	02097-19-0
2-(2-Furyl)benzimidazole	03878-19-1
2-Butanone, 3,3-dimethyl-1-(methylthio)-, O-[(methylamino)carbonyl]oxime	39196-18-4
2-Butenal	04170-30-3
2-Butenal, (E)-	00123-73-9
2-Butene, 1,4-dichloro-,(E)-	00110-57-6
2-Butenoic acid, 3-[(dimethoxyphosphinyl)oxy]-, methyl ester	07786-34-7
2-Chloro-1-ethanal	00107-20-0
2-Chloroethyl chlorocarbonate	00627-11-2
2-Cyclohexen-1-one, 2-methyl-5-(1-methylethenyl)-, (S)-	02244-16-8

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Names	CAS Number
4,4'-Bipyridinium, 1,1'-dimethyl-, dichloride	01910-42-5
4,7-Epoxyisobenzofuran-1,3-dione, hexahydro-3a,7a-dimethyl-, (3a.alpha.,4.bet...	00056-25-7
4,7-Methano-1H-indene, 1,2,4,5,6,7,8,8-octachloro-2,3,3a,4,7,7a-hexahydro-	00057-74-9
4,7-Methano-1H-isoindole-1,3(2H)-dione, 3a,4,7,7a-Tetrahydro-5-(hydroxyphenyl...	00991-42-4
4,7-Methanoindan, 1,2,4,5,6,7,8,8-octachloro-3a,4,7,7a-tetrahydro-	00057-74-9
4,7-Methanoisobenzofuran, 1,3,4,5,6,7,8,8-octachloro-1,3,3a,4,7,7a-hexahydro-	00297-78-9
4-Amino-N,N-dimethylaniline	00099-98-9
4-Biphenylacetic acid, 2-fluoroethyl ester	04301-50-2
4-Nitropyridine 1-oxide	01124-33-0
4-Pyridinamine	00504-24-5
4-Pyrimidinamine, 2-chloro-N,N,6-trimethyl-	00535-89-7
4-Pyrimidinecarboxylic acid, 1,2,3,6-tetrahydro-2,6-dioxo-	00065-86-1
5-Norbornene-2,3-dicarboximide, 5-(.alpha.-hydroxy-.alpha.-2-pyridylbenzyl)-7...	00991-42-4
5-Norbornene-2,3-dimethanol, 1,4,5,6,7,7-hexachloro-, cyclic sulfite	00115-29-7
5-aminomethyl-3-hydroxyisoxazole	02763-96-4
6,9-Methano-2,4,3-benzodioxathiepin, 6,7,8,9,10,10-hexachloro-1,5,5a,6,9,9a-h...	00115-29-7
6-Carboxyuracil	00065-86-1
7-Benzofuranol, 2,3-dihydro-2,2-dimethyl-, methylcarbamate	01563-66-2
7-Oxabicyclo[2.2.1]heptane-2,3-dicarboxylic anhydride, 2,3-dimethyl-	00056-25-7
9,10-Secoergosta-5,7,10(19),22-tetraen-3-ol, (3.beta.,5Z,7E,22E)-	00050-14-6
Acetaldehyde, chloro-	00107-20-0
Acetamide, 2-fluoro-	00640-19-7
Acetamide, N-(5,6,7,9-tetrahydro-1,2,3,10-tetramethoxy-9-oxobenzo[a]heptalen...	00064-86-8
Acetic acid, 2-methyl-2-propene-1,1-diol diester	10476-95-6
Acetic acid, chloro-	00079-11-8
Acetic acid, fluoro-	00144-49-0
Acetic acid, fluoro-, sodium salt	00062-74-8
Acetic acid, mercury(2+) salt	01600-27-7
Acetimidic acid, thio-N-[(methylcarbamoyl)oxy]-, methyl ester	16752-77-5
Acetone cyanohydrin	00075-86-5
Acetone thiosemicarbazide	01752-30-3
Acetone, thiosemicarbazone	01752-30-3

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2-Hydroxypropionitrile	00078-97-7
2-Methylphenol	00095-48-7
2-Methylpropionitrile	00078-82-0
2-Norbornanecarbonitrile, 5-chloro-6-oxo-, O-(methylcarbamoyl)oxime,(E)...	15271-41-7
2-Norbornene, 5-vinyl-	03048-64-4
2-Oxetanone	00057-57-8
2-Picoline, 5-vinyl-	00140-76-1
2-Propanone, 1,3-dichloro-	00534-07-6
2-Propen-1-amine	00107-11-9
2-Propen-1-ol	00107-18-6
2-Propenal	00107-02-8
2-Propene-1,1-diol, 2-methyl-, diacetate	10476-95-6
2-Propenenitrile, 2-methyl-	00126-98-7
2-Propenoic acid, 2-chloro-, methyl ester	00080-63-7
2-Propenoic acid, 2-methyl-, 2-isocyanatoethyl ester	30674-80-7
2-Propenoic acid, 2-methyl-, anhydride	00760-93-0
2-Propenoyl chloride	00814-68-6
2-Propenoyl chloride, 2-methyl-	00920-46-7
2-exo-Chloro-6-endo-cyano-2-norbornanone O-(methylcarbamoyl)oxime	15271-41-7
2-hydroxyisobutyronitrile	00075-86-5
2H-1-Benzopyran-2-one, 3-[1-(2-furanyl)-3-oxobutyl]-4-hydroxy-	00117-52-2
2H-1-Benzopyran-2-one, 3-[3-[4'[bromo[1,1'-biphenyl]-4-yl]-3-hydroxy-1-phenyl...	28772-56-7
2H-1-Benzopyran-2-one, 4-hydroxy-3-(1,2,3,4-tetrahydro-1-naphthalenyl)-	05836-29-3
2H-1-Benzopyran-2-one, 4-hydroxy-3-(3-oxo-1-phenylbutyl)-	00081-81-2
2H-1-Benzopyran-2-one, 4-hydroxy-3-(3-oxo-1-phenylbutyl)-, sodium salt	00129-06-6
3(2H)-Isoxazolone, 5-(aminomethyl)-	02763-96-4
3,3-Bis(chloromethyl)-1-oxacyclobutane	00078-71-7
3,3-dimethyl-1-(methylthio)-2-butanone-O-[(methylamino)carbonyl]oxime	39196-18-4
3-Bromopropyne	00106-96-7
3-Buten-2-one	00078-94-4
3-Chloro-4-methyl-7-coumarinyl diethyl phosphorothioate	00056-72-4
4,4'-Bipyridinium, 1,1'-dimethyl-, bis(methyl sulfate)	02074-50-2

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Acetonitrile, hydroxy-	00107-16-4
Acetonitrile, phenyl-	00140-29-4
Acetyl chloride, fluoro-	00359-06-8
Acetyl chloride, trichloro-	00076-02-8
Acrolein	00107-02-8
Acrylic acid, 2-chloro-, methyl ester	00080-63-7
Acryloyl chloride	00814-68-6
Acrylyl chloride	00814-68-6
Actidione	00066-81-9
Aldicarb	00116-06-3
Aldrin	00309-00-2
Allyl alcohol	00107-18-6
Allylamine	00107-11-9
Aluminum phosphide	20859-73-8
Aluminum phosphide (AlP)	20859-73-8
Aminopterin	00054-62-6
Amiton	00078-53-5
Amiton oxalate	03734-97-2
Ammonium chloride, alkyl(C8-C18)dimethyl-3,4-dichlorobenzyl-	08023-53-8
Ammonium chloroplatinate	16919-58-7
Ammonium, (2-chloroethyl)trimethyl-, chloride	00999-81-5
Ammonium, [4-[p-(diethylamino)-alpha-phenylbenzylidene)-2,5-cyclohexadien-1-...	00633-03-4
Amphetamine	00300-62-9
Aniline, 2,4,6-trimethyl-	00088-05-1
Antimony fluoride (SbF5)	07783-70-2
Antimony pentafluoride	07783-70-2
Antimycin A	01397-94-0
Antu	00086-88-4
Argentate(1-), bis(cyano-C)-, potassium	00506-61-6
Argentate(1-), dicyano-, potassium	00506-61-6
Arsenenous acid, sodium salt	07784-46-5
Arsenic acid	01303-28-2

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Arsenic acid (H3AsO4), calcium salt (2:3)	07778-44-1
Arsenic acid (H3AsO4), sodium salt	07631-89-2
Arsenic acid, calcium salt (2:3)	07778-44-1
Arsenic acid, sodium salt	07631-89-2
Arsenic chloride	07784-34-1
Arsenic hydride	07784-42-1
Arsenic oxide (As2O3)	01327-53-3
Arsenic oxide (As2O5)	01303-28-2
Arsenic pentoxide	01303-28-2
Arsenic trioxide	01327-53-3
Arsenious acid, potassium salt	10124-50-2
Arsenious acid, sodium salt	07784-46-5
Arsenous oxide	01327-53-3
Arsenous trichloride	07784-34-1
Arsine	07784-42-1
Arsine, dichloro(2-chlorovinyl)-	00541-25-3
Arsine, dichlorophenyl-	00696-28-6
Arsinic acid, dimethyl-, sodium salt	00124-65-2
Arsonic acid, phenyl-	00098-05-5
Arsonic acid, potassium salt	10124-50-2
Arsonous dichloride, (2-chloroethenyl)-	00541-25-3
Arsonous dichloride, phenyl-	00696-28-6
Azacyclohexane	00110-89-4
Azinphos-ethyl	02642-71-9
Azinphos-methyl	00086-50-0
Aziridine	00151-56-4
Aziridine, 2-methyl-	00075-55-8
Azirino[2',3':3,4]pyrrolo[1,2-a]indole-4,7-dione,6-amino-8-[[(aminocarbonyl)...	00050-07-7
Bacitracin	01405-87-4
Benzal chloride	00098-87-3
Benzenamine, 2,4,6-trimethyl-	00088-05-1
Benzenamine, 3-(trifluoromethyl)-	00098-16-8

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Benzene, (dichloromethyl)-	00098-87-3
Benzene, (trichloromethyl)-	00098-07-7
Benzene, 1,2,4-trimethyl-	00095-63-6
Benzene, 1,2-dichloro-4-isocyanato-	00102-36-3
Benzene, 1,3,5-trimethyl-	00108-67-8
Benzene, 1,3-diisocyanato-2-methyl-	00091-08-7
Benzene, 1,4-diisothiocyanato-	04044-65-9
Benzene, 1-(chloromethyl)-4-nitro-	00100-14-1
Benzene, 2-4-diisocyanato-1-methyl-	00584-84-9
Benzene, bis(chloromethyl)-	28347-13-9
Benzeneacetonitrile	00140-29-4
Benzenearsonic acid	00098-05-5
Benzeneethanamine, .alpha.-methyl-,(+-)-	00300-62-9
Benzenesulfonic chloride	00098-09-9
Benzenesulfonyl chloride	00098-09-9
Benzenethiol	00108-98-5
Benzimidazole, 2-(2-furyl)-	03878-19-1
Benzo[def]phenanthrene	00129-00-0
Benzoic acid, 2-hydroxy-, compd. with (3aS-cis)-1,2,3,3a,8,8a-hexahydro-1,3a,...	00057-64-7
Benzothiazole, 2-[(thiocyanatomethyl)thio]-	21564-17-0
Benzothiazolium, 3-ethyl-2-[5-(3-ethyl-2(3H)-benzothiazolylidene)-1,3-pentadi...	00514-73-8
Benzotrichloride	00098-07-7
Benzyl chloride	00100-44-7
Benzyl cyanide	00140-29-4
Bicyclo[2.2.1]hept-2-ene, 5-ethenyl-	03048-64-4
Bicyclo[2.2.1]heptane-2-carbonitrile, 5-chloro...	15271-41-7
Bis(chloromethyl) ketone	00534-07-6
Bis(dimethylamido)fluorophosphate	00115-26-4
Bis(methyl sulfate) salt of paraquat	02074-50-2
Bitoscanate	04044-65-9
Biuret, dithio-	00541-53-7

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Black phosphorus	07723-14-0
Blastmycin	01397-94-0
Borane, trichloro-	10294-34-5
Borane, trifluoro-	07637-07-2
Boron chloride [BCl3]	10294-34-5
Boron fluoride (BF3)	07637-07-2
Boron trichloride	10294-34-5
Boron trifluoride	07637-07-2
Boron trifluoride compound with methyl ether (1:1)	00353-42-4
Boron, trifluoro[oxybis[methane]]-, (T-4)	00353-42-4
Brilliant green	00633-03-4
Bromadiolone	28772-56-7
Bromine cyanide	00506-68-3
Buta-1,3-diene	00106-99-0
Butadiene	00106-99-0
Butane, 1,2:3,4-diepoxy-	01464-53-5
Butane, 1-(ethenyloxy)-	00111-34-2
Butanoic acid, 3-methyl-, butyl ester	00109-19-3
Butoxyethene	00111-34-2
Butyl isovalerate	00109-19-3
Butyl vinyl ether	00111-34-2
Butylamine, 4-(diethoxymethylsilyl)-	03037-72-7
C.I. basic green 1	00633-03-4
CI pigment green 21	12002-03-8
Cadmium oxide	01306-19-0
Cadmium oxide (CdO)	01306-19-0
Cadmium stearate	02223-93-0
Calciferol	00050-14-6
Calcium arsenate	07778-44-1
Camphechlor	08001-35-2
Cantharidin	00056-25-7
Carbachol chloride	00051-83-2

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Carbamic acid, dimethyl-, 1-[(dimethylamino)carbonyl]-5-methyl-1H-pyrazol-3-y...	00644-64-4
Carbamic acid, dimethyl-, 1-isopropyl-3-methylpyrazol-5-yl ester	00119-38-0
Carbamic acid, dimethyl-, 3-methyl-1-(1-methylethyl)-1H-pyrazol-5-yl ester	00119-38-0
Carbamic acid, dimethyl-, ester with 3-hydroxy-N,N,5-trimethylpyrazole-1-carb...	00644-64-4
Carbamic acid, methyl-, 2,3-dihydro-2,2-dimethyl-7-benzofuranyl ester	01563-66-2
Carbamic acid, methyl-, 3-methylphenyl ester	01129-41-5
Carbamic acid, methyl-, 4-(dimethylamino)-3,5-xylyl ester	00315-18-4
Carbamic acid, methyl-, 4-(methylthio)-3,5-xylyl ester	02032-65-7
Carbamic acid, methyl-, O-[[(2,4-dimethyl...	26419-73-8
Carbamic acid, methyl-, ester with N'-(4-hydroxy-o-tolyl)-N,N-dimethylformami...	17702-57-7
Carbamic acid, methyl-, ester with N'-(m-hydroxyphenyl)-N,N-dimethylformamid...	23422-53-9
Carbamic acid, methyl-, m-cym-5-yl ester	02631-37-0
Carbamic acid, methyl-, m-tolyl ester	01129-41-5
Carbofuran	01563-66-2
Carbohydrazide, thio-	02231-57-4
Carbolic acid	00108-95-2
Carbonic acid, dithallium(1+) salt	06533-73-9
Carbonic acid, thallium(1+) salt	06533-73-9
Carbonochloridic acid, 1-methylethyl ester	00108-23-6
Carbonochloridic acid, 2-chloroethyl ester	00627-11-2
Carbonochloridic acid, methyl ester	00079-22-1
Carbonochloridic acid, propyl ester	00109-61-5
Carbonothioic dihydrazide	02231-57-4
Carbophenothion	00786-19-6
Card-20(22)-enolide, 3-[(6-deoxy-.alpha.-2-mannopyranosyl)oxy]-1,5,11,14,19-...	00630-60-4
Card-20(22)-enolide, 3-[(O-2,6-dideoxy-.beta.-D-ribo-hexopyranosyl-(1...	20830-75-5
Card-20(22)-enolide, 3-[(O-2,6-dideoxy-.beta.-D-ribo-hexopyranosyl...	00071-63-6
Carvone	02244-16-8
Chlordane	00057-74-9
Chlorfenvinfos	00470-90-6
Chlorine	07782-50-5
Chlormephos	24934-91-6

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Chlormequat chloride	00999-81-5
Chloroacetaldehyde	00107-20-0
Chloroacetic acid	00079-11-8
Chloroethanol	00107-07-3
Chloroethyl chloroformate	00627-11-2
Chloroformic acid, methyl ester	00079-22-1
Chloromethyl ether	00542-88-1
Chloromethyl methyl ether	00107-30-2
Chlorophacinone	03691-35-8
Chlorophosphoric acid, diethyl ester	00814-49-3
Chlorotrimethyltin	01066-45-1
Chlorotriphenyltin	00639-58-7
Chloroxuron	01982-47-4
Chlorthiophos	21923-23-9
Choline chloride, carbamate	00051-83-2
Chromic chloride	10025-73-7
Chromium chloride (CrCl3)	10025-73-7
Chromium trichloride	10025-73-7
Cobalt	07440-48-4
Cobalt (II), N,N'-ethylenebis(3-fluorosalicylideneiminato)-	62207-76-5
Cobalt carbonyl	10210-68-1
Cobalt, [[2,2'-[1,2-ethanediylbis(nitrilomethy...	62207-76-5
Cobalt, [[2,2'-[1,2-ethanediylbis(nitrilomethylidyne]bis[phenolato]](2-)-N,N'...	14167-18-1
Cobalt, di-.mu.-carbonylhexacarbonyldi-, (Co-Co)	10210-68-1
Colchicine	00064-86-8
Compound No. 1080	00062-74-8
Copper aceto-arsenite	12002-03-8
Corrosive sublimate	07487-94-7
Coumafuryl	00117-52-2
Coumaphos	00056-72-4
Coumarin, 3-(.alpha.-acetonylbenzyl)-4-hydroxy-	00081-81-2
Coumarin, 3-(.alpha.-acetonylbenzyl)-4-hydroxy-, sodium salt	00129-06-6

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Coumarin, 3-(.alpha.-acetonylfurfuryl)-4-hydroxy-	00117-52-2
Coumarin, 3-[3-(4'-bromo-1,1'-biphenyl-4-yl)-3-hydroxy-1-phenylpropyl]-4-...	28772-56-7
Coumarin, 4-hydroxy-3-(1,2,3,4-tetrahydro-1-naphthyl)-	05836-29-3
Coumatetralyl	05836-29-3
Cresylic acid	00095-48-7
Crimidine	00535-89-7
Crotonaldehyde	00123-73-9
Crotonaldehyde	04170-30-3
Crotonaldehyde, (E)-	00123-73-9
Crotonic acid, 3-hydroxy-, methyl ester, dimethyl phosphate	07786-34-7
Crotylaldehyde	04170-30-3
Cyanogen bromide	00506-68-3
Cyanogen iodide	00506-78-5
Cyanogen monobromide	00506-68-3
Cyanophos	02636-26-2
Cyanuric fluoride	00675-14-9
Cyclohexane, 1,2,3,4,5,6-hexachloro-, (1.alpha.,2.alpha.,3.beta.,4.alpha.,5.a...	00058-89-9
Cyclohexane, 5-isocyanato-1-(isocyanatomethyl)-1,3,3-trimethyl-	04098-71-9
Cyclohexane, nitro-	01122-60-7
Cycloheximide	00066-81-9
Cyclopentane	00287-92-3
DDVP	00062-73-7
DNOC	00534-52-1
Decaborane(14)	17702-41-9
Demeton	08065-48-3
Demeton-S-methyl	00919-86-8
Dialifos	10311-84-9
Diammonium hexachloroplatinate(2-)	16919-58-7
Diborane	19287-45-7
Diborane (6)	19287-45-7
Dibutyl phthalate	00084-74-2
Dichlorobenzalkonium chloride	08023-53-8

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Dichloroethyl ether	00111-44-4
Dichloromethylphenylsilane	00149-74-6
Dichlorvos	00062-73-7
Dicobalt octacarbonyl	10210-68-1
Dicrotophos	00141-66-2
Diepoxybutane	01464-53-5
Diethyl 4-nitrophenyl phosphorothionate	00056-38-2
Diethyl chlorophosphate	00814-49-3
Diethyl-p-phenylenediamine	00093-05-0
Diethylcarbamazine citrate	01642-54-2
Digitoxin	00071-63-6
Diglycidyl ether	02238-07-5
Digoxin	20830-75-5
Dihydrogen selenide	07783-07-5
Diisopropyl fluorophosphate	00055-91-4
Dimefox	00115-26-4
Dimethoate	00060-51-5
Dimethyl (E)-2-dimethylcarbamoyl-1-methylvinyl phosphate	00141-66-2
Dimethyl p-(methylthio)phenyl phosphate	03254-63-5
Dimethyl phosphorochloridothioate	02524-03-0
Dimethyl phthalate	00131-11-3
Dimethyl sulfate	00077-78-1
Dimethyl sulfide	00075-18-3
Dimethyl-p-phenylenediamine	00099-98-9
Dimethyldichlorosilane	00075-78-5
Dimethylhydrazine	00057-14-7
Dimetilan	00644-64-4
Dinitrocresol	00534-52-1
Dinoseb	00088-85-7
Dinoterb	01420-07-1
Dioctyl phthalate	00117-84-0
Dioxathion	00078-34-2

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Diphacinone	00082-66-6
Diphosphoramide, octamethyl-	00152-16-9
Diphosphoric acid, tetraethyl ester	00107-49-3
Disodium selenate	13410-01-0
Disodium selenite	10102-18-8
Disulfide, dimethyl	00624-92-0
Disulfoton	00298-04-4
Dithallium trioxide	01314-32-5
Dithiazanine iodide	00514-73-8
Dithiobiuret	00541-53-7
EPN	02104-64-5
Emetan, 6',7',10,11-tetramethoxy-, dihydrochloride	00316-42-7
Emetine, dihydrochloride	00316-42-7
Endosulfan	00115-29-7
Endothion	02778-04-3
Endrin	00072-20-8
Ergocalciferol	00050-14-6
Ergotaman-3',6',18-trione, 12'-hydroxy-2'-methyl-5'-(phenylmethyl...	00379-79-3
Ergotamine tartrate	00379-79-3
Ergotamine, bitartrate	00379-79-3
Ethanamine, 2-chloro-N,N-bis(2-chloroethyl)-	00555-77-1
Ethanamine, 2-chloro-N-(2-chloroethyl)-N-ethyl-	00538-07-8
Ethanamine, 2-chloro-N-(2-chloroethyl)-N-methyl-	00051-75-2
Ethanaminium, 2-chloro-N,N,N-trimethyl-, chloride	00999-81-5
Ethanaminium, N-[4-[[4-(diethylamino)phenyl]phenylmethylene]-2-5-cyclohexad...	00633-03-4
Ethanaminium,2-[(aminocarbonyl)oxy]-N,N,N-trimethyl-, chloride	00051-83-2
Ethane, 1,1'-oxybis[2-chloro-	00111-44-4
Ethane, 1,1'-thiobis[2-chloro-	00505-60-2
Ethane, pentachloro-	00076-01-7
Ethaneperoxoic acid	00079-21-0
Ethanesulfonyl chloride, 2-chloro-	01622-32-8

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Ethanimidothioic acid, 2-(dimethylamino)-N-[[(methylamino)carbonyl]oxy]-2-oxo...	23135-22-0
Ethanimidothioic acid, N-[[(methylamino)carbonyl]oxy]-, methyl ester	16752-77-5
Ethanol, 1,2-dichloro-, acetate	10140-87-1
Ethanol, 2-chloro-	00107-07-3
Ethanol, 2-fluoro-	00371-62-0
Ether, bis(2-chloroethyl)	00111-44-4
Ether, chloromethyl methyl	00107-30-2
Ethion	00563-12-2
Ethoprophos	13194-48-4
Ethyl rhodanate	00542-90-5
Ethyl thiocyanate	00542-90-5
Ethylbis(2-chloroethyl)amine	00538-07-8
Ethylene chlorohydrin	00107-07-3
Ethylene fluorohydrin	00371-62-0
Ethylene glycol formal	00646-06-0
Ethylenediamine	00107-15-3
Ethyleneimine	00151-56-4
Ethylmercuric phosphate	02235-25-8
Ethylmercury phosphate	02235-25-8
Fenamiphos	22224-92-6
Fenitrothion	00122-14-5
Fensulfothion	00115-90-2
Fluenetil	04301-50-2
Fluorine	07782-41-4
Fluoroacetamide	00640-19-7
Fluoroacetic acid	00144-49-0
Fluoroacetyl chloride	00359-06-8
Fluorouracil	00051-21-8
Folic acid, 4-amino-	00054-62-6
Fonofos	00944-22-9
Formaldehyde cyanohydrin	00107-16-4
Formetanate	23422-53-9

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Formic acid, 1-methylethyl ester	00625-55-8
Formic acid, chloro-, 2-chloroethyl ester	00627-11-2
Formic acid, chloro-, propyl ester	00109-61-5
Formic acid, isopropyl ester	00625-55-8
Formic acid-, chloro-, methyl ester	00079-22-1
Formothion	02540-82-1
Formparanate	17702-57-7
Fosthietan	21548-32-3
Fuberidazole	03878-19-1
Furan	00110-00-9
Gallium chloride (GaCl3)	13450-90-3
Gallium trichloride	13450-90-3
Hexachlorocyclopentadiene	00077-47-4
Hexachloronaphthalene	01335-87-1
Hexahydropyridine	00110-89-4
Hexamethylenediamine, N,N'-dibutyl-	04835-11-4
Hydrazine	00302-01-2
Hydrazine, 1,1-dimethyl-	00057-14-7
Hydrazine, methyl-	00060-34-4
Hydrazine, phenyl-, hydrochloride	00059-88-1
Hydrazine, phenyl-, monohydrochloride	00059-88-1
Hydrazinecarbothioamide	00079-19-6
Hydrazinecarbothioamide, 2-(1-methylethylidene)-	01752-30-3
Hydrazinecarboxamide monohydrochloride	00563-41-7
Hydrazinecarboxamide, monohydrochloride	00563-41-7
Hydrocyanic acid	00074-90-8
Hydrofluoric acid	07664-39-3
Hydrogen arsenide	07784-42-1
Hydrogen cyanide	00074-90-8
Hydrogen fluoride	07664-39-3
Hydrogen selenide	07783-07-5
Imidocarbonic acid, phosphonodithio-, cyclic ethylene P,P-diethyl ester	00947-02-4

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Imidocarbonic acid, phosphonodithio-, cyclic propylene P,P-diethyl ester	00950-10-7
Indole-3-acetic acid, 1-(p-chlorobenzoyl)-5-methoxy-2-methyl-	00053-86-1
Indomethacin	00053-86-1
Iodine cyanide	00506-78-5
Iodine monocyanide	00506-78-5
Iridic chloride	10025-97-5
Iridium chloride (IrCl4)	10025-97-5
Iridium tetrachloride	10025-97-5
Iron carbonyl (Fe(CO)5), (TB-5-11)-	13463-40-6
Iron, pentacarbonyl-	13463-40-6
Isobenzan	00297-78-9
Isobutyronitrile	00078-82-0
Isocyanic acid, 2-methyl-m-phenylene ester	00091-08-7
Isocyanic acid, 3,4-dichlorophenyl ester	00102-36-3
Isocyanic acid, 4-methyl-m-phenylene ester	00584-84-9
Isocyanic acid, methyl ester	00624-83-9
Isocyanic acid, methylene(3,5,5-trimethyl-3,1-cyclohexylene) ester	04098-71-9
Isodrin	00465-73-6
Isofluorphate	00055-91-4
Isophorone diisocyanate	04098-71-9
Isopropyl chlorocarbonate	00108-23-6
Isopropyl chloroformate	00108-23-6
Isopropyl formate	00625-55-8
Isopropyl phosphorofluoridate	00055-91-4
Isopropylmethylpyrazolyl dimethylcarbamate	00119-38-0
Isothiocyanic acid, methyl ester	00556-61-6
Isothiocyanic acid, p-phenylene ester	04044-65-9
Isovaleric acid, butyl ester	00109-19-3
L-Glutamic acid, N-[4-[[(2,4-diamino-6-pteridinyl)methyl]amino]benzoyl]-	00054-62-6
Lactonitrile	00078-97-7
Lactonitrile, 2-methyl-	00075-86-5
Leptophos	21609-90-5

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Lewisite	00541-25-3
Lindane	00058-89-9
Lithium hydride	07580-67-8
Lithium hydride (LiH)	07580-67-8
Lithium monohydride	07580-67-8
MMT	12108-13-3
MVP	00140-76-1
Malonic acid, dithallous salt	02757-18-8
Malononitrile	00109-77-3
Manganese, tricarbonyl methylcyclopentadienyl	12108-13-3
Manganese, tricarbonyl(methyl-.pi.-cyclopentadienyl)-	12108-13-3
Manganese, tricarbonyl[(1,2,3,4,5-(.eta.)-1-methyl-2,4-cyclopentadien-1-yl]-	12108-13-3
Mechlorethamine	00051-75-2
Mephosfolan	00950-10-7
Mercaptobenzene	00108-98-5
Mercurate(2-), ethyl[phosphato(3-)-O]-, dihydrogen	02235-25-8
Mercuric acetate	01600-27-7
Mercuric chloride	07487-94-7
Mercuric oxide	21908-53-2
Mercury (II) chloride	07487-94-7
Mercury (II) oxide	21908-53-2
Mercury chloride (HgCl2)	07487-94-7
Mercury oxide (HgO)	21908-53-2
Mercury(2+) acetate	01600-42-7
Mercury, (acetato)(2-methoxyethyl)-	00151-38-2
Mercury, (acetato-O)(2-methoxyethyl)-	00151-38-2
Mercury, (acetato-O)phenyl-	00062-38-4
Mercury, (cyanoguanidinato-N')methyl-	00502-39-6
Mercury, (dihydrogen phosphato)ethyl-	02235-25-8
Mesitylamine	00088-05-1
Mesitylene	00108-67-8
Methacrolein diacetate	10476-95-6

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Methacrylic anhydride	00760-93-0
Methacrylonitrile	00126-98-7
Methacryloyl anhydride	00760-93-0
Methacryloyl chloride	00920-46-7
Methacryloyloxyethyl isocyanate	30674-80-7
Methamidophos	10265-92-6
Methanamine, N-methyl-N-nitroso-	00062-75-9
Methane, chloromethoxy-	00107-30-2
Methane, dicyano-	00109-77-3
Methane, isocyanato-	00624-83-9
Methane, isothiocyanato-	00556-61-6
Methane, oxybis[chloro-	00542-88-1
Methane, tetranitro-	00509-14-8
Methane, thiobis-	00075-18-3
Methanesulfenyl chloride, trichloro-	00594-42-3
Methanesulfonyl fluoride	00558-25-8
Methanethiol	00074-93-1
Methanimidamide, N,N-dimethyl-N'-[2-methyl-4-[[(methylamino)carbonyl]oxy]phen...	17702-57-7
Methanimidamide, N,N-dimethyl-N'-[3-[[(methylamino)carbonyl]oxy]phenyl-...	23422-53-9
Methidathion	00950-37-8
Methiocarb	02032-65-7
Methomyl	16752-77-5
Methoxyethylmercuric acetate	00151-38-2
Methyl 2-chloroacrylate	00080-63-7
Methyl chlorocarbonate	00079-22-1
Methyl chloroformate	00079-22-1
Methyl disulfide	00624-92-0
Methyl ether, compd. with boron fluoride (BF3) (1:1)	00353-42-4
Methyl isocyanate	00624-83-9
Methyl isothiocyanate	00556-61-6
Methyl mercaptan	00074-93-1
Methyl phenkapton	03735-23-7

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Methyl phosphonic dichloride	00676-97-1
Methyl sulfate	00077-78-1
Methyl sulfide	00075-18-3
Methyl thiocyanate	00556-64-9
Methyl vinyl ketone	00078-94-4
Methylcymantrene	12108-13-3
Methylhydrazine	00060-34-4
Methylmercuric dicyanamide	00502-39-6
Methylphenyldichlorosilane	00149-74-6
Methylsilyl trichloride	00075-79-6
Methyltrichlorosilane	00075-79-6
Methylviologen	01910-42-5
Metolcarb	01129-41-5
Mevinphos	07786-34-7
Mexacarbate	00315-18-4
Mitomycin C	00050-07-7
Monoallylamine	00107-11-9
Monochloroacetic acid	00079-11-8
Monochlorodimethyl ether	00107-30-2
Monocrotophos	06923-22-4
Monofluoroacetamide	00640-19-7
Monofluoroacetic acid	00144-49-0
Monomethylhydrazine	00060-34-4
Muscimol	02763-96-4
Mustard gas	00505-60-2
N,N'-Dibutylhexamethylenediamine	04835-11-4
N,N-Diethyl-p-phenylenediamine	00093-05-0
N,N-Dimethyl-p-benzenediamine	00099-98-9
Naphthalene, hexachloro-	01335-87-1
Nickel	07440-02-0
Nickel carbonyl	13463-39-3
Nickel carbonyl [Ni(CO)4], (T-4)-	13463-39-3

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Nickel tetracarbonyl	13463-39-3
Nicotine	00054-11-5
Nicotine sulfate	00065-30-5
Nicotine, sulfate (2:1)	00065-30-5
Nitric acid	07697-37-2
Nitric oxide	10102-43-9
Nitrocyclohexane	01122-60-7
Nitrogen dioxide	10102-44-0
Nitrogen mustard	00051-75-2
Nitrogen oxide	10102-44-0
Nitrogen oxide (NO)	10102-43-9
Nitrosodimethylamine	00062-75-9
Norbormide	00991-42-4
O,O,O',O'-Tetraethyl S,S'-methylenebis(phosphorodithioate)	00563-12-2
O,O-Dimethyl S-(ethylmercapto)ethyl thiophosphate	00919-86-8
O,O-Dimethyl-(1-hydroxy-2,2,2-trichloroethyl)phosphonate	00052-68-6
O,S-Dimethyl phosphoramidothioate	10265-92-6
O-Ethyl O-2,4,5-trichlorophenyl ethylphosphonothioate	00327-98-0
O-Ethyl S,S-dipropyl phosphorodithioate	13194-48-4
Octadecanoic acid, cadmium salt	02223-93-0
Organorhodium complex	PMN-82-147
Orotic acid	00065-86-1
Osmic acid anhydride	20816-12-0
Osmium oxide (OsO4), (T-4)-	20816-12-0
Osmium tetroxide	20816-12-0
Ouabain	00630-60-4
Oxacyclopentadiene	00110-00-9
Oxamimidic acid, N',N'-dimethyl-N-[(methylcarbamoyl)oxy]-1-thio-, methyl ester	23135-22-0
Oxamyl	23135-22-0
Oxetane, 3,3-bis(chloromethyl)-	00078-71-7
Oxirane, 2,2'-[oxybis(methylene)bis-	02238-07-5
Oxydisulfoton	02497-07-6

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Ozone	10028-15-6
Paraquat	01910-42-5
Paraquat methosulfate	02074-50-2
Parathion	00056-38-2
Parathion-methyl	00298-00-0
Paris green	12002-03-8
Pentaborane	19624-22-7
Pentaborane (9)	19624-22-7
Pentacarbonyliron	13463-40-6
Pentachloroethane	00076-01-7
Pentachlorophenol	00087-86-5
Pentadecylamine	02570-26-5
Pentamethylene	00287-92-3
Pentamethyleneimine	00110-89-4
Peracetic acid	00079-21-0
Perchlorocyclopentadiene	00077-47-4
Perchloromethylmercaptan	00594-42-3
Peroxyacetic acid	00079-21-0
Phenarsazine oxide	00058-36-6
Phenol	00108-95-2
Phenol, 2,2'-thiobis(4-chloro-6-methyl-	04418-66-0
Phenol, 2,2'-thiobis[4,6-dichloro-	00097-18-7
Phenol, 2-(1,1-dimethylethyl)-4,6-dinitro-	01420-07-1
Phenol, 2-(1-methylpropyl)-4,6-dinitro-	00088-85-7
Phenol, 2-methyl-	00095-48-7
Phenol, 2-methyl-4,6-dinitro-	00534-52-1
Phenol, 2-methyl-5-(1-methylethyl)-, methylcarbamate	02631-37-0
Phenol, 2-sec-butyl-4,6-dinitro-	00088-85-7
Phenol, 3,5-dimethyl-4-(methylthio)-, methylcarbamate	02032-65-7
Phenol, 3-(1-methylethyl)-, methylcarbamate	00064-00-6
Phenol, 4-(dimethylamino)-3,5-dimethyl-, methylcarbamate (ester)	00315-18-4
Phenol, pentachloro-	00087-86-5

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Phenol, pentachloro-, sodium salt	00131-52-2
Phenoxarsine, 10,10'-oxydi-	00058-36-6
Phenyl dichloroarsine	00696-28-6
Phenyl mercaptan	00108-98-5
Phenylacetonitrile	00140-29-4
Phenylarsonic acid	00098-05-5
Phenylhydrazine hydrochloride	00059-88-1
Phenylmercuric acetate	00062-38-4
Phenylmercury acetate	00062-38-4
Phenylmethyldichlorosilane	00149-74-6
Phenylsilatrane	02097-19-0
Phenylsilicon trichloride	00098-13-5
Phenylthiocarbamide	00103-85-5
Phenylthiourea	00103-85-5
Phorate	00298-02-2
Phosacetim	04104-14-7
Phosfolan	00947-02-4
Phosmet	00732-11-6
Phosophorothioic acid, O,O-dimethyl O-(4-nitrophenyl) ester	00298-00-0
Phosphamidon	13171-21-6
Phosphine	07803-51-2
Phosphonic acid, (2,2,2-trichloro-1-hydroxyethyl)-, dimethyl ester	00052-68-6
Phosphonic diamide, P-(5-Amino-3-phenyl-1H-1,2,4-triazol-1-yl)-N,N,N',N'-tetr...	01031-47-6
Phosphonic dichloride, methyl-	00676-97-1
Phosphonodithioic acid, ethyl-, O-ethyl S-phenyl ester	00944-22-9
Phosphonofluoridic acid, methyl-, 1-methylethyl ester	00107-44-8
Phosphonofluoridic acid, methyl-, isopropyl ester	00107-44-8
Phosphonothioic acid, ethyl-, O-ethyl O-(2,4,5-trichlorophenyl)ester	00327-98-0
Phosphonothioic acid, methyl-, O-(4-nitrophenyl...	02665-30-7
Phosphonothioic acid, methyl-, O-ethyl O-[4-...	02703-13-1
Phosphonothioic acid, methyl-, S-[2-[bis...	50782-69-9
Phosphonothioic acid, phenyl-, O-(4-bromo-2,5-dichlorophenyl) O-methyl ester	21609-90-5

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Phosphonothioic acid, phenyl-, O-ethyl O-(4-nitrophenyl) ester	02104-64-5
Phosphonothioic acid, phenyl-, O-ethyl O-(p-nitrophenyl)ester	02104-64-5
Phosphoramidic acid, (1-methylethyl)-, ethyl [3-methyl-4-(methylthio)phenyl]...	22224-92-6
Phosphoramidic acid, (4-methyl-1,3-dithiolan-2-ylidene)-, diethyl ester	00950-10-7
Phosphoramidic acid, 1,3-dithietan-2-ylidene-, diethyl ester	21548-32-3
Phosphoramidic acid, 1,3-dithiolan-2-ylidene-, diethyl ester	00947-02-4
Phosphoramidic acid, isopropyl-, 4-(methylthio)-m-tolyl ethyl ester	22224-92-6
Phosphoramidocyanidic acid, dimethyl-, ethyl ester	00077-81-6
Phosphoramidothioic acid, (1-iminoethyl)-, O,O-bis(4-chlorophenyl) ester	04104-14-7
Phosphoramidothioic acid, O,S-dimethyl ester	10265-92-6
Phosphoramidothioic acid, acetimidoyl-, O,O-bis(p-chlorophenyl) ester	04104-14-7
Phosphorane, pentachloro-	10026-13-8
Phosphoric acid, 2,2-dichloroethenyl dimethyl ester	00062-73-7
Phosphoric acid, 2,2-dichlorovinyl dimethyl ester	00062-73-7
Phosphoric acid, 2-chloro-1-(2,4-dichlorophenyl)ethenyl diethyl ester	00470-90-6
Phosphoric acid, 2-chloro-1-(2,4-dichlorophenyl)vinyl diethyl ester	00470-90-6
Phosphoric acid, 2-chloro-3-(diethylamino)-1-methyl-3-oxo-1-propenyldimet...	13171-21-6
Phosphoric acid, 3-(dimethylamino)-1-methyl-3-oxo-1-propenyl dimethyl ester, (E)	00141-66-2
Phosphoric acid, dimethyl 1-methyl-3-(methylamino)-3-oxo-1-propenyl ester, (E)-	06923-22-4
Phosphoric acid, dimethyl 4-(methylthio)phenyl...	03254-63-5
Phosphoric acid, dimethyl ester, ester with 2-chloro-N,N-diethyl-3-hydroxycro...	13171-21-6
Phosphoric acid, dimethyl ester, ester with 3-hydroxy-N-methylcrotonamide, (E)-	06923-22-4
Phosphoric anhydride	01314-56-3
Phosphoric chloride	10026-13-8
Phosphorochloridic acid, diethyl ester	00814-49-3
Phosphorochloridothioic acid, O,O-dimethyl ester	02524-03-0
Phosphorodiamidic fluoride, tetramethyl-	00115-26-4
Phosphorodithioic acid O,O-dimethyl ester, S-ester with 2-mercapto-N-methylac..	00060-51-5
Phosphorodithioic acid, O,O-diethyl S-[(4-oxo-1,2,3-benzotriazin-3(4H)-yl)met...	02642-71-9
Phosphorodithioic acid, O,O-diethyl S-[(ethylthio)methyl] ester	00298-02-2
Phosphorodithioic acid, O,O-diethyl S-[2-(ethylsulfinyl)ethyl] ester	02497-07-6
Phosphorodithioic acid, O,O-diethyl S-[2-(ethylthio)ethyl] ester	00298-04-4

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Phosphorodithioic acid, O,O-diethyl S-[2-[(1-methylethyl)amino]-2-oxoethyl]...	02275-18-5
Phosphorodithioic acid, O,O-diethyl ester, S-ester with 3-(mercaptomethyl)-1,...	02642-71-9
Phosphorodithioic acid, O,O-diethyl ester, S-ester with N-(2-chloro-1-mercapt...	10311-84-9
Phosphorodithioic acid, O,O-diethyl ester, S-ester with N-isopropyl-2-mercapt...	02275-18-5
Phosphorodithioic acid, O,O-dimethyl S-(2-ethylthio)ethyl ester	00640-15-3
Phosphorodithioic acid, O,O-dimethyl S-[(4-oxo-1,2,3-benzotriazin-3(4H)-yl)me...	00086-50-0
Phosphorodithioic acid, O,O-dimethyl S-[2-(methylamino)-2-oxoethyl] ester	00060-51-5
Phosphorodithioic acid, O,O-dimethyl ester, S-ester with N-(mercaptomethyl)...	00732-11-6
Phosphorodithioic acid, O,O-dimethyl ester, S-ester with N-formyl-2-mercapto-...	02540-82-1
Phosphorodithioic acid, O,O-dimethyl ester, S-ester, S-ester with 3-(mercapto...	00086-50-0
Phosphorodithioic acid, O-ethyl S,S-dipropyl ester	13194-48-4
Phosphorodithioic acid, S,S'-1,4-dioxane-2,3-diyl O,O,O',O'-tetraethyl ester	00078-34-2
Phosphorodithioic acid, S,S'-methylene O,O,O',O'-tetraethyl ester	00563-12-2
Phosphorodithioic acid, S,S'-p-dioxane-2,3-diyl O,O,O',O'-tetraethyl ester	00078-34-2
Phosphorodithioic acid, S-(chloroethyl) O,O-diethyl ester	24934-91-6
Phosphorodithioic acid, S-[(1,3-dihydro-1,3-dioxo-2H-isoindol-2-yl)methyl]...	00732-11-6
Phosphorodithioic acid, S-[(4-chlorophenyl)thio]methyl O,O-diethylester	00786-19-6
Phosphorodithioic acid, S-[(5-methoxy-2-oxo-1,3,4-thiadiazol-3(2H)-yl)methyl...	00950-37-8
Phosphorodithioic acid, S-[(tert-butylthio)methyl] O,O-diethyl ester	13071-79-9
Phosphorodithioic acid, S-[2-(ethylthio)ethyl] O,O-dimethyl ester	00640-15-3
Phosphorodithioic acid, S-[2-(formylmethylamino)-2-oxoethyl] O,O-dimethyl ester	02540-82-1
Phosphorodithioic acid, S-[2-chloro-1-(1,3-dihydro-1,3-dioxo-2H-isoindol-2-yl...	10311-84-9
Phosphorodithioic acid, S-[[(1,1-dimethylethyl)thio]methyl] O,O-diethyl ester	13071-79-9
Phosphorodithioic acid, S-[[(2,5-dichlorophenyl)thio]methyl] O,O-dimethyl ester	03735-23-7
Phosphorofluoridic acid, bis(1-methylethyl) ester	00055-91-4
Phosphorothioic acid, O,O-diethyl O-(1-phenyl-1H-1,2,4-triazol-3-yl) ester	24017-47-8
Phosphorothioic acid, O,O-diethyl O-(4-nitrophenyl) ester	00056-38-2
Phosphorothioic acid, O,O-diethyl O-[(2,5-dichloro-4-methylthio)phenyl] ester	21923-23-9
Phosphorothioic acid, O,O-diethyl O-[2-(ethylthio)ethyl] ester, mixed with...	08065-48-3
Phosphorothioic acid, O,O-diethyl O-[4-(methylsulfinyl)phenyl] ester	00115-90-2
Phosphorothioic acid, O,O-diethyl O-[p-(methylsulfinyl)phenyl] ester	00115-90-2
Phosphorothioic acid, O,O-diethyl O-pyrazinyl ester	00297-97-2

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Phosphorothioic acid, O,O-dimethyl O-(3-methyl-4-nitrophenyl) ester	00122-14-5
Phosphorothioic acid, O,O-dimethyl O-(4-nitro-m-tolyl) ester	00122-14-5
Phosphorothioic acid, O,O-dimethyl O-(p-nitrophenyl) ester	00298-00-0
Phosphorothioic acid, O,O-dimethyl ester, O-ester with p-hydroxybenzonitrile	02636-26-2
Phosphorothioic acid, O,O-dimethyl ester, S-ester with 2-(mercaptomethyl)-5-...	02778-04-3
Phosphorothioic acid, O-(3-chloro-4-methyl-2-oxo-2H-1-benzopyran-7-yl) O,O-di...	00056-72-4
Phosphorothioic acid, O-(4-cyanophenyl) O,O-dimethyl ester	02636-26-2
Phosphorothioic acid, O-[2,5-dichloro-4-(methylthio)phenyl] O,O-diethyl ester	21923-23-9
Phosphorothioic acid, O-[2-(diethylamino)-6-methyl-4-pyrimidinyl] O,O-diethyl...	23505-41-1
Phosphorothioic acid, S-[(5-methoxy-4-oxo-4H-pyran-2-yl)methyl] O,O-di...	02778-04-3
Phosphorothioic acid, S-[2-(diethylamino)ethyl] O,O-diethyl ester, oxalate (1:1)	03734-97-2
Phosphorothioic acid, S-[2-(diethylamino)ethyl] O,O-dimethyl ester,...	03734-97-2
Phosphorothioic acid, S-[2-(dimethylamino)ethyl] O,O-diethyl ester	00078-53-5
Phosphorothioic acid, S-[2-(ethylthio)ethyl] O,O-dimethyl ester	00919-86-8
Phosphorus	07723-14-0
Phosphorus (red)	07723-14-0
Phosphorus (white)	07723-14-0
Phosphorus (yellow)	07723-14-0
Phosphorus oxide (P2O5)	01314-56-3
Phosphorus oxychloride	10025-87-3
Phosphorus oxytrichloride	10025-87-3
Phosphorus pentachloride	10026-13-8
Phosphorus pentoxide	01314-56-3
Phosphorus trichloride	07719-12-2
Phosphoryl chloride	10025-87-3
Phthalic acid, dibutyl ester	00084-74-2
Phthalic acid, dimethyl ester	00131-11-3
Phthalic acid, dioctyl ester	00117-84-0
Phylloquinone	00084-80-0
Physostigmine	00057-47-6
Physostigmine monosalicylate	00057-64-7
Physostigmine, salicylate (1:1)	00057-64-7

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Picrotoxin	00124-87-8
Piperidine	00110-89-4
Piperonal bis[2-(2-butoxyethoxy)ethyl] acetal	05281-13-0
Piprotal	05281-13-0
Pirimifos-ethyl	23505-41-1
Platinate(2-), hexachloro-, diammonium, (OC-6-11)	16919-58-7
Platinous chloride	10025-65-7
Platinum (IV) chloride	13454-96-1
Platinum chloride (PtCl2)	10025-65-7
Platinum chloride (PtCl4), (SP-4-1)-	13454-96-1
Platinum dichloride	10025-65-7
Platinum tetrachloride	13454-96-1
Plumbane, tetraethyl-	00078-00-2
Potassium arsenite	10124-50-2
Potassium cyanide	00151-50-8
Potassium silver cyanide	00506-61-6
Promecarb	02631-37-0
Propanal, 2-methyl-2-(methylthio)-, O-[(methylamino)carbonyl]oxime	00116-06-3
Propanedinitrile	00109-77-3
Propanedioic acid, dithallium salt	02757-18-8
Propanenitrile	00107-12-0
Propanenitrile, 2-hydroxy-	00078-97-7
Propanenitrile, 2-hydroxy-2-methyl-	00075-86-5
Propanenitrile, 2-methyl-	00078-82-0
Propanenitrile, 3-chloro-	00542-76-7
Propanol, (2-propenyloxy)-	01331-17-5
Propanol, (allyloxy)-	01331-17-5
Propanolide	00057-57-8
Propargyl bromide	00106-96-7
Propiolactone, .beta.-	00057-57-8
Propionaldehyde, 2-methyl-2-(methylthio)-, O-(methylcarbamoyl)oxime	00116-06-3
Propionitrile	00107-12-0

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Propyl chlorocarbonate	00109-61-5
Propyl chloroformate	00109-61-5
Propylene glycol, allyl ether	01331-17-5
Propyleneimine	00075-55-8
Prothoate	02275-18-5
Prussic acid	00074-90-8
Pseudocumene	00095-63-6
Pyrene	00129-00-0
Pyridine, 2-methyl-5-vinyl-	00140-76-1
Pyridine, 3-(1-methyl-2-pyrrolidinyl)-, (S)-	00054-11-5
Pyridine, 3-(1-methyl-2-pyrrolidinyl)-, (S)-, sulfate	00065-30-5
Pyridine, 4-amino-	00504-24-5
Pyridine, 4-nitro-, 1-oxide	01124-33-0
Pyridine, 5-ethenyl-2-methyl-	00140-76-1
Pyrimidine, 2-chloro-4-(dimethylamino)-6-methyl-	00535-89-7
Pyriminil	53558-25-1
Pyrophosphoramide, octamethyl-	00152-16-9
Pyrophosphoric acid, tetraethyl ester	00107-49-3
Pyrrolo(2,3-b)indol-5-ol, 1,2,3,3a,8,8a-hexahydro-1,3a,8-trimethyl-, methyl...	00057-47-6
Rhodium chloride (RhCl3)	10049-07-7
Rhodium trichloride	10049-07-7
S-(Chloromethyl) O,O-diethyl phosphorodithioate	24934-91-6
Salcomine	14167-18-1
Sarin	00107-44-8
Selenic acid (H2SeO4), disodium salt	13410-01-0
Seleninyl chloride	07791-23-3
Selenious acid (H2SeO3)	07783-00-8
Selenious acid (H2SeO3), disodium salt	10102-18-8
Selenious acid, disodium salt	10102-18-8
Selenium oxychloride	07791-23-3
Selenium oxydichloride	07791-23-3

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Names	CAS Number
Selenous acid	07783-00-8
Semicarbazide hydrochloride	00563-41-7
Semicarbazide monohydrochloride	00563-41-7
Silane, (4-aminobutyl)diethoxymethyl-	03037-72-7
Silane, chlorotrimethyl-	00075-77-4
Silane, dichlorodimethyl-	00075-78-5
Silane, dichloromethylphenyl-	00149-74-6
Silane, trichloro(chloromethyl)-	01558-25-4
Silane, trichloro(dichlorophenyl)-	27137-85-5
Silane, trichloroethyl-	00115-21-9
Silane, trichloromethyl-	00075-79-6
Silane, trichlorophenyl-	00098-13-5
Silane, triethoxy-	00998-30-1
Silver potassium cyanide	00506-61-6
Sodium PCP	00131-52-2
Sodium anthraquinone-1-sulfonate	00128-56-3
Sodium arsenate	07631-89-2
Sodium arsenite	07784-46-5
Sodium azide (Na(N3))	26628-22-8
Sodium cacodylate	00124-65-2
Sodium cyanide	00143-33-9
Sodium dimethylarsonate	00124-65-2
Sodium fluoroacetate	00062-74-8
Sodium monofluoroacetate	00062-74-8
Sodium pentachlorophenate	00131-52-2
Sodium pentachlorophenoxide	00131-52-2
Sodium selenate	13410-01-0
Sodium selenite	10102-18-8
Sodium tellurite	10102-20-2
Stannane, chlorotrimethyl-	01066-45-1
Stannane, chlorotriphenyl-	00639-58-7
Stannane, tetraethyl-	00597-64-8

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Stearic acid, cadmium salt	02223-93-0
Strophanthin G	00630-60-4
Strychnidin-10-one	00057-24-9
Strychnidin-10-one, sulfate (2:1)	00060-41-3
Strychnine	00057-24-9
Strychnine, sulfate	00060-41-3
Sulfide, bis(2-chloroethyl)	00505-60-2
Sulfotep	03689-24-5
Sulfoxide, 3-chloropropyl octyl	03569-57-1
Sulfur fluoride (SF4), (T-4)-	07783-60-0
Sulfur tetrafluoride	07783-60-0
Sulfur trioxide	07446-11-9
Sulfuric acid	07664-93-9
Sulfuric acid, dimethyl ester	00077-78-1
Sulfuric acid, dithallium(1+) salt	07446-18-6
Sulfuric acid, thallium salt	10031-59-1
Sulfuric anhydride	07446-11-9
TEPP	00107-49-3
TNM	00509-14-8
Tabun	00077-81-6
Telluric acid (H2TeO3), disodium salt	10102-20-2
Tellurium	13494-80-9
Tellurium fluoride (TeF6), (OC-6-11)-	07783-80-4
Tellurium hexafluoride	07783-80-4
Tellurous acid (H2TeO3), disodium salt	10102-20-2
Terbufos	13071-79-9
Tetraethyl pyrophosphate	00107-49-3
Tetraethyllead	00078-00-2
Tetraethyltin	00597-64-8
Tetranitromethane	00509-14-8
Tetrosan	08023-53-8
Thallic oxide	01314-32-5

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Thallium (III) oxide	01314-32-5
Thallium chloride (TlCl)	07791-12-0
Thallium oxide (Tl2O3)	01314-32-5
Thallium sulfate	10031-59-1
Thallium(I)sulfate	07446-18-6
Thallous carbonate	06533-73-9
Thallous chloride	07791-12-0
Thallous malonate	02757-18-8
Thallous sulfate	07446-18-6
Thallous sulfate	10031-59-1
Thiocarbazide	02231-57-4
Thiocarbonic dihydrazide	02231-57-4
Thiocyanic acid, (2-benzothiazolylthio)methyl ester	21564-17-0
Thiocyanic acid, ethyl ester	00542-90-5
Thiocyanic acid, methyl ester	00556-64-9
Thiodiphosphoric acid ([(HO)2P(S)]2O), tetraethyl ester	03689-24-5
Thiofanox	39196-18-4
Thioimidodicarbonic diamide	00541-53-7
Thiometon	00640-15-3
Thionazin	00297-97-2
Thiophenol	00108-98-5
Thiopyrophosphoric acid ([(HO)2P(S)]2O), tetraethyl ester	03689-24-5
Thiosemicarbazide	00079-19-6
Thiourea, (2-chlorophenyl)-	05344-82-1
Thiourea, (2-methylphenyl)-	00614-78-8
Thiourea, 1-naphthalenyl-	00086-88-4
Thiourea, phenyl-	00103-85-5
Tin, tetraethyl-	00597-64-8
Titanium chloride (TiCl4)	07550-45-0
Titanium chloride (TiCl4), (T-4)-	07550-45-0
Titanium tetrachloride	07550-45-0
Toluene 2,4-diisocyanate	00584-84-9

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Toluene 2,6-diisocyanate	00091-08-7
Tolylene-2,4-diisocyanate	00584-84-9
Toxaphene	08001-35-2
Triamiphos	01031-47-6
Triazofos	24017-47-8
Trichloro(chloromethyl)silane	01558-25-4
Trichloro(dichlorophenyl)silane	27137-85-5
Trichloroacetyl chloride	00076-02-8
Trichloroethylsilane	00115-21-9
Trichloromethanesulfenyl chloride	00594-42-3
Trichloronate	00327-98-0
Trichlorophenylsilane	00098-13-5
Trichlororhodium	10049-07-7
Trichlorphon	00052-68-6
Triethoxysilane	00998-30-1
Triethylamine, 2,2'-dichloro-	00538-07-8
Triethylamine, 2,2'2"-trichloro-	00555-77-1
Trimethylchlorosilane	00075-77-4
Trimethylolpropane phosphite	00824-11-3
Trimethyltin chloride	01066-45-1
Triphenyltin chloride	00639-58-7
Tris(.beta.-chloroethyl)amine	00555-77-1
Tris(2-chloroethyl)amine	00555-77-1
UDMH	00057-14-7
Uracil, 5-fluoro-	00051-21-8
Urea, 1-(1-naphthyl)-2-thio-	00086-88-4
Urea, 1-(o-chlorophenyl)-2-thio-	05344-82-1
Urea, 1-nitrophenyl-3-(3-pyridylmethyl)-	53558-25-1
Urea, 2-thio-1-o-tolyl-	00614-78-8
Urea, 3-[p-(p-chlorophenoxy)phenyl]-1,1-dimethyl-	01982-47-4
Urea, N'-[4-(4-chlorophenoxy)phenyl]-N,N-dimethyl-	01982-47-4
Urea, N-(4-nitrophenyl)-N'-(3-pyridinylmethyl)-	53558-25-1

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Names	CAS Number
Valinomycin	02001-95-8
Vanadic anhydride	01314-62-1
Vanadium oxide (V2O5)	01314-62-1
Vanadium pentoxide	01314-62-1
Vinyl butyl ether	00111-34-2
Vinylnorbornene	03048-64-4
Violet Phosphorus	07723-14-0
Vitamin D2	00050-14-6
Vitamin K1	00084-80-0
Warfarin	00081-81-2
Warfarin sodium	00129-06-6
Whey factor	00065-86-1
Xylene, .alpha.,.alpha.'-dichloro-	28347-13-9
Xylylene dichloride	28347-13-9
Zinc phosphide	01314-84-7
Zinc phosphide (Zn3P2)	01314-84-7
Zinc, dichloro[4,4-dimethyl-5-[[[(methylamino)...	58270-08-9
[1,1'-Biphenyl]-4-acetic acid, 2-fluoroethyl ester	04301-50-2
alpha-Hydroxypropionitrile	00078-97-7
dl-.alpha.-Methylphenethylamine	00300-62-9
m-(Trifluoromethyl)aniline	00098-16-8
m-Cumenyl methylcarbamate	00064-00-6
m-Tolylene diisocyanate	00091-08-7
o-Cresol, 6,6'-thiobis[4-chloro-	04418-66-0
o-Cresylic acid	00095-48-7
o-Hydroxytoluene	00095-48-7
o-Methylphenol	00095-48-7
p-Mentha-6,8-dien-2-one, (S)-(+)-	02244-16-8
p-Nitrobenzyl chloride	00100-14-1
s-Triazine, 2,4,6-trifluoro-	00675-14-9
trans-1,4-Dichloro-2-butene	00110-57-6
trans-1,4-Dichlorobutene	00110-57-6

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00050-07-7	Azirino[2',3':3,4]pyrrolo[1,2-a]indole-4,7-dione,6-amino-8-[[(aminocarbonyl)...
00050-07-7	Mitomycin C
00050-14-6	9,10-Secoergosta-5,7,10(19),22-tetraen-3-ol, (3.beta.,5Z,7E,22E)-
00050-14-6	Ergocalciferol
00050-14-6	Calciferol
00050-14-6	Vitamin D2
00051-21-8	2,4(1H,3H)-Pyrimidinedione, 5-fluoro-
00051-21-8	Fluorouracil
00051-21-8	Uracil, 5-fluoro-
00051-75-2	Ethanamine, 2-chloro-N-(2-chloroethyl)-N-methyl-
00051-75-2	Mechlorethamine
00051-75-2	Nitrogen mustard
00051-83-2	Ethanaminium,2-[(aminocarbonyl)oxy]-N,N,N-trimethyl-, chloride
00051-83-2	Carbachol chloride
00051-83-2	Choline chloride, carbamate
00052-68-6	Phosphonic acid, (2,2,2-trichloro-1-hydroxyethyl)-, dimethyl ester
00052-68-6	Trichlorphon
00052-68-6	O,O-Dimethyl-(1-hydroxy-2,2,2-trichloroethyl)phosphonate
00053-86-1	1H-Indole-3-acetic acid, 1-(4-chlorobenzoyl)-5-methoxy-2-methyl-
00053-86-1	Indomethacin
00053-86-1	Indole-3-acetic acid, 1-(p-chlorobenzoyl)-5-methoxy-2-methyl-
00054-11-5	Pyridine, 3-(1-methyl-2-pyrrolidinyl)-, (S)-
00054-11-5	Nicotine
00054-62-6	L-Glutamic acid, N-[4-[[(2,4-diamino-6-pteridinyl)methyl]amino]benzoyl]-
00054-62-6	Aminopterin
00054-62-6	Folic acid, 4-amino-
00055-91-4	Phosphorofluoridic acid, bis(1-methylethyl) ester
00055-91-4	Isofluorphate
00055-91-4	Isopropyl phosphorofluoridate
00055-91-4	Diisopropyl fluorophosphate
00056-25-7	4,7-Epoxyisobenzofuran-1,3-dione, hexahydro-3a,7a-dimethyl-, (3a.alpha.,4.bet...
00056-25-7	Cantharidin

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00056-25-7	7-Oxabicyclo[2.2.1]heptane-2,3-dicarboxylic anhydride, 2,3-dimethyl-
00056-38-2	Phosphorothioic acid, O,O-diethyl O-(4-nitrophenyl) ester
00056-38-2	Parathion
00056-38-2	Diethyl 4-nitrophenyl phosphorothionate
00056-72-4	Phosphorothioic acid, O-(3-chloro-4-methyl-2-oxo-2H-1-benzopyran-7-yl) O,O-di...
00056-72-4	Coumaphos
00056-72-4	3-Chloro-4-methyl-7-coumarinyl diethyl phosphorothioate
00057-14-7	Hydrazine, 1,1-dimethyl-
00057-14-7	Dimethylhydrazine
00057-14-7	1,1-Dimethylhydrazine
00057-14-7	UDMH
00057-24-9	Strychnidin-10-one
00057-24-9	Strychnine
00057-47-6	Pyrrolo(2,3-b)indol-5-ol, 1,2,3,3a,8,8a-hexahydro-1,3a,8-trimethyl-, methyl...
00057-47-6	Physostigmine
00057-57-8	2-Oxetanone
00057-57-8	Propiolactone, .beta.-
00057-57-8	Propanolide
00057-64-7	Benzoic acid, 2-hydroxy-, compd. with (3aS-cis)-1,2,3,3a,8,8a-hexahydro-1,3a,...
00057-64-7	Physostigmine, salicylate (1:1)
00057-64-7	Physostigmine monosalicylate
00057-74-9	4,7-Methano-1H-indene, 1,2,4,5,6,7,8,8-octachloro-2,3,3a,4,7,7a-hexahydro-
00057-74-9	Chlordane
00057-74-9	4,7-Methanoindan, 1,2,4,5,6,7,8,8-octachloro-3a,4,7,7a-tetrahydro-
00058-36-6	10H-Phenoxarsine, 10,10'-oxybis-
00058-36-6	Phenarsazine oxide
00058-36-6	Phenoxarsine, 10,10'-oxydi-
00058-89-9	Cyclohexane, 1,2,3,4,5,6-hexachloro-, (1.alpha.,2.alpha.,3.beta.,4.alpha.,5.a...
00058-89-9	Lindane
00058-89-9	.gamma.-Benzene hexachloride
00059-88-1	Hydrazine, phenyl-, monohydrochloride
00059-88-1	Phenylhydrazine hydrochloride

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00059-88-1	Hydrazine, phenyl-, hydrochloride
00060-34-4	Hydrazine, methyl-
00060-34-4	Methylhydrazine
00060-34-4	Monomethylhydrazine
00060-41-3	Strychnidin-10-one, sulfate (2:1)
00060-41-3	Strychnine, sulfate
00060-51-5	Phosphorodithioic acid, O,O-dimethyl S-[2-(methylamino)-2-oxoethyl] ester
00060-51-5	Dimethoate
00060-51-5	Phosphorodithioic acid O,O-dimethyl ester, S-ester with 2-mercapto-N-methylac..
00062-38-4	Mercury, (acetato-O)phenyl-
00062-38-4	Phenylmercury acetate
00062-38-4	Phenylmercuric acetate
00062-73-7	Phosphoric acid, 2,2-dichloroethenyl dimethyl ester
00062-73-7	Dichlorvos
00062-73-7	DDVP
00062-73-7	Phosphoric acid, 2,2-dichlorovinyl dimethyl ester
00062-74-8	Acetic acid, fluoro-, sodium salt
00062-74-8	Sodium fluoroacetate
00062-74-8	Compound No. 1080
00062-74-8	Sodium monofluoroacetate
00062-75-9	Methanamine, N-methyl-N-nitroso-
00062-75-9	Nitrosodimethylamine
00064-00-6	Phenol, 3-(1-methylethyl)-, methylcarbamate
00064-00-6	m-Cumenyl methylcarbamate
00064-86-8	Acetamide, N-(5,6,7,9-tetrahydro-1,2,3,10-tetramethoxy-9-oxobenzo[a]heptalen...
00064-86-8	Colchicine
00065-30-5	Pyridine, 3-(1-methyl-2-pyrrolidinyl)-, (S)-, sulfate
00065-30-5	Nicotine sulfate
00065-30-5	Nicotine, sulfate (2:1)
00065-86-1	4-Pyrimidinecarboxylic acid, 1,2,3,6-tetrahydro-2,6-dioxo-
00065-86-1	Orotic acid
00065-86-1	Whey factor

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00065-86-1	6-Carboxyuracil
00066-81-9	2,6-Piperidinedione, 4-[2-(3,5-dimethyl-2-oxocyclohexyl)-2-hydroxyethyl...
00066-81-9	Cycloheximide
00066-81-9	Actidione
00071-63-6	Card-20(22)-enolide, 3-[(O-2,6-dideoxy-.beta.-D-ribo-hexopyranosyl...
00071-63-6	Digitoxin
00072-20-8	2,7:3,6-Dimethanonaphth[2,3-b]oxirene, 3,4,5,6,9,9-hexachloro-1a,2,2a,3,6,6a,...
00072-20-8	Endrin
00072-20-8	1,4:5,8-Dimethanonaphthalene, 1,2,3,4,10,10-hexachloro-6,7-epoxy-1,4,4a,5,6,7...
00074-90-8	Hydrocyanic acid
00074-90-8	Hydrogen cyanide
00074-90-8	Prussic acid
00074-93-1	Methanethiol
00074-93-1	Methyl mercaptan
00075-18-3	Methane, thiobis-
00075-18-3	Dimethyl sulfide
00075-18-3	Methyl sulfide
00075-55-8	Aziridine, 2-methyl-
00075-55-8	Propyleneimine
00075-77-4	Silane, chlorotrimethyl-
00075-77-4	Trimethylchlorosilane
00075-78-5	Silane, dichlorodimethyl-
00075-78-5	Dimethyldichlorosilane
00075-79-6	Silane, trichloromethyl-
00075-79-6	Methyltrichlorosilane
00075-79-6	Methylsilyl trichloride
00075-86-5	Propanenitrile, 2-hydroxy-2-methyl-
00075-86-5	Acetone cyanohydrin
00075-86-5	Lactonitrile, 2-methyl-
00075-86-5	2-hydroxyisobutyronitrile
00076-01-7	Ethane, pentachloro-
00076-01-7	Pentachloroethane

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00076-02-8	Trichloroacetyl chloride
00076-02-8	Acetyl chloride, trichloro-
00077-47-4	1,3-Cyclopentadiene, 1,2,3,4,5,5-hexachloro-
00077-47-4	Hexachlorocyclopentadiene
00077-47-4	Perchlorocyclopentadiene
00077-78-1	Sulfuric acid, dimethyl ester
00077-78-1	Dimethyl sulfate
00077-78-1	Methyl sulfate
00077-81-6	Phosphoramidocyanidic acid, dimethyl-, ethyl ester
00077-81-6	Tabun
00078-00-2	Plumbane, tetraethyl-
00078-00-2	Tetraethyllead
00078-34-2	Phosphorodithioic acid, S,S'-1,4-dioxane-2,3-diyl O,O,O',O'-tetraethyl ester
00078-34-2	Dioxathion
00078-34-2	Phosphorodithioic acid, S,S'-p-dioxane-2,3-diyl O,O,O',O'-tetraethyl ester
00078-53-5	Phosphorothioic acid, S-[2-(dimethylamino)ethyl] O,O-diethyl ester
00078-53-5	Amiton
00078-71-7	Oxetane, 3,3-bis(chloromethyl)-
00078-71-7	3,3-Bis(chloromethyl)-1-oxacyclobutane
00078-82-0	Propanenitrile, 2-methyl-
00078-82-0	Isobutyronitrile
00078-82-0	2-Methylpropionitrile
00078-94-4	3-Buten-2-one
00078-94-4	Methyl vinyl ketone
00078-94-4	1-Buten-3-one
00078-97-7	Propanenitrile, 2-hydroxy-
00078-97-7	Lactonitrile
00078-97-7	2-Hydroxypropionitrile
00078-97-7	alpha-Hydroxypropionitrile
00079-11-8	Acetic acid, chloro-
00079-11-8	Chloroacetic acid
00079-11-8	Monochloroacetic acid

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00079-19-6	Hydrazinecarbothioamide
00079-19-6	Thiosemicarbazide
00079-19-6	1-Amino-2-thiourea
00079-21-0	Ethaneperoxoic acid
00079-21-0	Peracetic acid
00079-21-0	Peroxyacetic acid
00079-22-1	Carbonochloridic acid, methyl ester
00079-22-1	Methyl chloroformate
00079-22-1	Formic acid-, chloro-, methyl ester
00079-22-1	Chloroformic acid, methyl ester
00079-22-1	Methyl chlorocarbonate
00080-63-7	2-Propenoic acid, 2-chloro-, methyl ester
00080-63-7	Methyl 2-chloroacrylate
00080-63-7	Acrylic acid, 2-chloro-, methyl ester
00081-81-2	2H-1-Benzopyran-2-one, 4-hydroxy-3-(3-oxo-1-phenylbutyl)-
00081-81-2	Warfarin
00081-81-2	Coumarin, 3-(.alpha.-acetonylbenzyl)-4-hydroxy-
00082-66-6	1H-Indene-1,3(2H)-dione, 2-(diphenylacetyl)-
00082-66-6	Diphacinone
00082-66-6	1,3-Indandione, 2-diphenylacetyl-
00084-74-2	1,2-Benzenedicarboxylic acid, dibutyl ester
00084-74-2	Dibutyl phthalate
00084-74-2	Phthalic acid, dibutyl ester
00084-80-0	1,4-Naphthalenedione, 2-methyl-3-(3,7,11,15-tetramethyl-2-hexadecenyl)-, [R-[...
00084-80-0	Phylloquinone
00084-80-0	Vitamin K1
00086-50-0	Phosphorodithioic acid, O,O-dimethyl S-[(4-oxo-1,2,3-benzotriazin-3(4H)-yl)me...
00086-50-0	Azinphos-methyl
00086-50-0	Phosphorodithioic acid, O,O-dimethyl ester, S-ester, S-ester with 3-(mercapto...
00086-88-4	Thiourea, 1-naphthalenyl-
00086-88-4	Antu
00086-88-4	1-Naphthylthiourea

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00086-88-4	Urea, 1-(1-naphthyl)-2-thio-
00087-86-5	Phenol, pentachloro-
00087-86-5	Pentachlorophenol
00088-05-1	Benzenamine, 2,4,6-trimethyl-
00088-05-1	Aniline, 2,4,6-trimethyl-
00088-05-1	Mesitylamine
00088-85-7	Phenol, 2-(1-methylpropyl)-4,6-dinitro-
00088-85-7	Dinoseb
00088-85-7	Phenol, 2-sec-butyl-4,6-dinitro-
00091-08-7	Benzene, 1,3-diisocyanato-2-methyl-
00091-08-7	Toluene 2,6-diisocyanate
00091-08-7	Isocyanic acid, 2-methyl-m-phenylene ester
00091-08-7	m-Tolylene diisocyanate
00091-08-7	2,6-TDI
00093-05-0	1,4-Benzenediamine, N,N-diethyl-
00093-05-0	Diethyl-p-phenylenediamine
00093-05-0	N,N-Diethyl-p-phenylenediamine
00095-48-7	Phenol, 2-methyl-
00095-48-7	Cresylic acid
00095-48-7	o-Cresylic acid
00095-48-7	o-Hydroxytoluene
00095-48-7	o-Methylphenol
00095-48-7	2-Methylphenol
00095-63-6	Benzene, 1,2,4-trimethyl-
00095-63-6	Pseudocumene
00095-63-6	.psi.-Cumene
00097-18-7	Phenol, 2,2'-thiobis[4,6-dichloro-
00098-05-5	Arsonic acid, phenyl-
00098-05-5	Benzenearsonic acid
00098-05-5	Phenylarsonic acid
00098-07-7	Benzene, (trichloromethyl)-
00098-07-7	Benzotrichloride

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00098-09-9	Benzenesulfonyl chloride
00098-09-9	Benzenesulfonic chloride
00098-13-5	Silane, trichlorophenyl-
00098-13-5	Trichlorophenylsilane
00098-13-5	Phenylsilicon trichloride
00098-16-8	Benzenamine, 3-(trifluoromethyl)-
00098-16-8	m-(Trifluoromethyl)aniline
00098-87-3	Benzene, (dichloromethyl)-
00098-87-3	Benzal chloride
00099-98-9	1,4-Benzenediamine, N,N-dimethyl-
00099-98-9	Dimethyl-p-phenylenediamine
00099-98-9	N,N-Dimethyl-p-benzenediamine
00099-98-9	4-Amino-N,N-dimethylaniline
00100-14-1	Benzene, 1-(chloromethyl)-4-nitro-
00100-14-1	p-Nitrobenzyl chloride
00100-44-7	Benzene, (chloromethyl)-
00100-44-7	Benzyl chloride
00102-36-3	Benzene, 1,2-dichloro-4-isocyanato-
00102-36-3	Isocyanic acid, 3,4-dichlorophenyl ester
00103-85-5	Thiourea, phenyl-
00103-85-5	Phenylthiourea
00103-85-5	Phenylthiocarbamide
00106-96-7	1-Propyne, 3-bromo-
00106-96-7	Propargyl bromide
00106-96-7	3-Bromopropyne
00106-99-0	1,3-Butadiene
00106-99-0	Butadiene
00106-99-0	Buta-1,3-diene
00107-02-8	2-Propenal
00107-02-8	Acrolein
00107-07-3	Ethanol, 2-chloro-
00107-07-3	Chloroethanol

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CAS Number	Names
00107-07-3	Ethylene chlorohydrin
00107-11-9	2-Propen-1-amine
00107-11-9	Allylamine
00107-11-9	Monoallylamine
00107-12-0	Propanenitrile
00107-12-0	Propionitrile
00107-15-3	1,2-Ethanediamine
00107-15-3	Ethylenediamine
00107-15-3	1,2-Diaminoethane
00107-16-4	Acetonitrile, hydroxy-
00107-16-4	Formaldehyde cyanohydrin
00107-18-6	2-Propen-1-ol
00107-18-6	Allyl alcohol
00107-20-0	Acetaldehyde, chloro-
00107-20-0	Chloroacetaldehyde
00107-20-0	2-Chloro-1-ethanal
00107-30-2	Methane, chloromethoxy-
00107-30-2	Chloromethyl methyl ether
00107-30-2	Ether, chloromethyl methyl
00107-30-2	Monochlorodimethyl ether
00107-44-8	Phosphonofluoridic acid, methyl-, 1-methylethyl ester
00107-44-8	Sarin
00107-44-8	Phosphonofluoridic acid, methyl-, isopropyl ester
00107-49-3	Diphosphoric acid, tetraethyl ester
00107-49-3	TEPP
00107-49-3	Pyrophosphoric acid, tetraethyl ester
00107-49-3	Tetraethyl pyrophosphate
00108-23-6	Carbonochloridic acid, 1-methylethyl ester
00108-23-6	Isopropyl chloroformate
00108-23-6	Isopropyl chlorocarbonate
00108-67-8	Benzene, 1,3,5-trimethyl-
00108-67-8	Mesitylene

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00108-95-2	Phenol
00108-95-2	Carbolic acid
00108-98-5	Benzenethiol
00108-98-5	Thiophenol
00108-98-5	Mercaptobenzene
00108-98-5	Phenyl mercaptan
00109-19-3	Butanoic acid, 3-methyl-, butyl ester
00109-19-3	Butyl isovalerate
00109-19-3	Isovaleric acid, butyl ester
00109-61-5	Carbonochloridic acid, propyl ester
00109-61-5	Propyl chloroformate
00109-61-5	Propyl chlorocarbonate
00109-61-5	Formic acid, chloro-, propyl ester
00109-77-3	Propanedinitrile
00109-77-3	Malononitrile
00109-77-3	Methane, dicyano-
00110-00-9	Furan
00110-00-9	Oxacyclopentadiene
00110-57-6	2-Butene, 1,4-dichloro-,(E)-
00110-57-6	trans-1,4-Dichlorobutene
00110-57-6	trans-1,4-Dichloro-2-butene
00110-89-4	Piperidine
00110-89-4	Azacyclohexane
00110-89-4	Hexahydropyridine
00110-89-4	Pentamethyleneimine
00111-34-2	Butane, 1-(ethenyloxy)-
00111-34-2	Butyl vinyl ether
00111-34-2	Butoxyethene
00111-34-2	Vinyl butyl ether
00111-44-4	Ethane, 1,1'-oxybis[2-chloro-
00111-44-4	Dichloroethyl ether
00111-44-4	Ether, bis(2-chloroethyl)

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CAS Number	Names
00115-21-9	Silane, trichloroethyl-
00115-21-9	Trichloroethylsilane
00115-26-4	Phosphorodiamidic fluoride, tetramethyl-
00115-26-4	Dimefox
00115-26-4	Bis(dimethylamido)fluorophosphate
00115-29-7	6,9-Methano-2,4,3-benzodioxathiepin, 6,7,8,9,10,10-hexachloro-1,5,5a,6,9,9a-h...
00115-29-7	Endosulfan
00115-29-7	5-Norbornene-2,3-dimethanol, 1,4,5,6,7,7-hexachloro-, cyclic sulfite
00115-90-2	Phosphorothioic acid, O,O-diethyl O-[4-(methylsulfinyl)phenyl] ester
00115-90-2	Fensulfothion
00115-90-2	Phosphorothioic acid, O,O-diethyl O-[p-(methylsulfinyl)phenyl] ester
00116-06-3	Propanal, 2-methyl-2-(methylthio)-, O-[(methylamino)carbonyl]oxime
00116-06-3	Aldicarb
00116-06-3	Propionaldehyde, 2-methyl-2-(methylthio)-, O-(methylcarbamoyl)oxime
00117-52-2	2H-1-Benzopyran-2-one, 3-[1-(2-furanyl)-3-oxobutyl]-4-hydroxy-
00117-52-2	Coumafuryl
00117-52-2	Coumarin, 3-(.alpha.-acetonylfurfuryl)-4-hydroxy-
00117-84-0	1,2-Benzenedicarboxylic acid, dioctyl ester
00117-84-0	Dioctyl phthalate
00117-84-0	Phthalic acid, dioctyl ester
00119-38-0	Carbamic acid, dimethyl-, 3-methyl-1-(1-methylethyl)-1H-pyrazol-5-yl ester
00119-38-0	Isopropylmethylpyrazolyl dimethylcarbamate
00119-38-0	Carbamic acid, dimethyl-, 1-isopropyl-3-methylpyrazol-5-yl ester
00122-14-5	Phosphorothioic acid, O,O-dimethyl O-(3-methyl-4-nitrophenyl) ester
00122-14-5	Fenitrothion
00122-14-5	Phosphorothioic acid, O,O-dimethyl O-(4-nitro-m-tolyl) ester
00123-73-9	2-Butenal, (E)-
00123-73-9	Crotonaldehyde
00123-73-9	Crotonaldehyde, (E)-
00124-65-2	Arsinic acid, dimethyl-, sodium salt
00124-65-2	Sodium cacodylate
00124-65-2	Sodium dimethylarsonate

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00124-87-8	Picrotoxin
00126-98-7	2-Propenenitrile, 2-methyl-
00126-98-7	Methacrylonitrile
00128-56-3	1-Anthracenesulfonic acid, 9,10-dihydro-9,10-dioxo-, sodium salt
00128-56-3	Sodium anthraquinone-1-sulfonate
00129-00-0	Pyrene
00129-00-0	Benzo[def]phenanthrene
00129-06-6	2H-1-Benzopyran-2-one, 4-hydroxy-3-(3-oxo-1-phenylbutyl)-, sodium salt
00129-06-6	Warfarin sodium
00129-06-6	Coumarin, 3-(.alpha.-acetonylbenzyl)-4-hydroxy-, sodium salt
00131-11-3	1,2-Benzenedicarboxylic acid, dimethyl ester
00131-11-3	Dimethyl phthalate
00131-11-3	Phthalic acid, dimethyl ester
00131-52-2	Phenol, pentachloro-, sodium salt
00131-52-2	Sodium pentachlorophenate
00131-52-2	Sodium pentachlorophenoxide
00131-52-2	Sodium PCP
00140-29-4	Benzeneacetonitrile
00140-29-4	Benzyl cyanide
00140-29-4	Phenylacetonitrile
00140-29-4	Acetonitrile, phenyl-
00140-76-1	Pyridine, 5-ethenyl-2-methyl-
00140-76-1	2-Picoline, 5-vinyl-
00140-76-1	MVP
00140-76-1	Pyridine, 2-methyl-5-vinyl-
00141-66-2	Phosphoric acid, 3-(dimethylamino)-1-methyl-3-oxo-1-propenyl dimethyl ester, (E)
00141-66-2	Dicrotophos
00141-66-2	Dimethyl (E)-2-dimethylcarbamoyl-1-methylvinyl phosphate
00143-33-9	Sodium cyanide
00144-49-0	Acetic acid, fluoro-
00144-49-0	Fluoroacetic acid
00144-49-0	Monofluoroacetic acid

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00149-74-6	Silane, dichloromethylphenyl-
00149-74-6	Dichloromethylphenylsilane
00149-74-6	Methylphenyldichlorosilane
00149-74-6	Phenylmethyldichlorosilane
00151-38-2	Mercury, (acetato-O)(2-methoxyethyl)-
00151-38-2	Methoxyethylmercuric acetate
00151-38-2	Mercury, (acetato)(2-methoxyethyl)-
00151-50-8	Potassium cyanide
00151-56-4	Aziridine
00151-56-4	Ethyleneimine
00152-16-9	Diphosphoramide, octamethyl-
00152-16-9	Pyrophosphoramide, octamethyl-
00287-92-3	Cyclopentane
00287-92-3	Pentamethylene
00297-78-9	Isobenzan
00297-78-9	4,7-Methanoisobenzofuran, 1,3,4,5,6,7,8,8-octachloro-1,3,3a,4,7,7a-hexahydro-
00297-97-2	Phosphorothioic acid, O,O-diethyl O-pyrazinyl ester
00297-97-2	Thionazin
00298-00-0	Phosophorothioic acid, O,O-dimethyl O-(4-nitrophenyl) ester
00298-00-0	Parathion-methyl
00298-00-0	Phosphorothioic acid, O,O-dimethyl O-(p-nitrophenyl) ester
00298-02-2	Phosphorodithioic acid, O,O-diethyl S-[(ethylthio)methyl] ester
00298-02-2	Phorate
00298-04-4	Phosphorodithioic acid, O,O-diethyl S-[2-(ethylthio)ethyl] ester
00298-04-4	Disulfoton
00300-62-9	Benzeneethanamine, .alpha.-methyl-,(+-)-
00300-62-9	Amphetamine
00300-62-9	(+-)-Desoxynorephedrine
00300-62-9	dl-.alpha.-Methylphenethylamine
00302-01-2	Hydrazine
00309-00-2	1,4:5,8-Dimethanonaphthalene, 1,2,3,4,10,10-hexachloro-1,4,4a,5,8,8a-hexahydr...
00309-00-2	Aldrin

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00315-18-4	Phenol, 4-(dimethylamino)-3,5-dimethyl-, methylcarbamate (ester)
00315-18-4	Mexacarbate
00315-18-4	Carbamic acid, methyl-, 4-(dimethylamino)-3,5-xylyl ester
00316-42-7	Emetan, 6',7',10,11-tetramethoxy-, dihydrochloride
00316-42-7	Emetine, dihydrochloride
00327-98-0	Phosphonothioic acid, ethyl-, O-ethyl O-(2,4,5-trichlorophenyl)ester
00327-98-0	Trichloronate
00327-98-0	O-Ethyl O-2,4,5-trichlorophenyl ethylphosphonothioate
00353-42-4	Boron, trifluoro[oxybis[methane]]-, (T-4)
00353-42-4	Boron trifluoride compound with methyl ether (1:1)
00353-42-4	Methyl ether, compd. with boron fluoride (BF3) (1:1)
00359-06-8	Acetyl chloride, fluoro-
00359-06-8	Fluoroacetyl chloride
00371-62-0	Ethanol, 2-fluoro-
00371-62-0	Ethylene fluorohydrin
00379-79-3	Ergotaman-3',6',18-trione, 12'-hydroxy-2'-methyl-5'-(phenylmethyl...
00379-79-3	Ergotamine tartrate
00379-79-3	Ergotamine, bitartrate
00465-73-6	1,4:5,8-Dimethanonaphthalene, 1,2,3,4,10,10-hexachloro-1,4,4a,5,8,8a-hexahydr...
00465-73-6	Isodrin
00470-90-6	Phosphoric acid, 2-chloro-1-(2,4-dichlorophenyl)ethenyl diethyl ester
00470-90-6	Chlorfenvinfos
00470-90-6	Phosphoric acid, 2-chloro-1-(2,4-dichlorophenyl)vinyl diethyl ester
00502-39-6	Mercury, (cyanoguanidinato-N')methyl-
00502-39-6	Methylmercuric dicyanamide
00504-24-5	4-Pyridinamine
00504-24-5	Pyridine, 4-amino-
00505-60-2	Ethane, 1,1'-thiobis[2-chloro-
00505-60-2	Mustard gas
00505-60-2	Sulfide, bis(2-chloroethyl)
00505-60-2	.beta.,.beta.'-Dichloroethyl sulfide
00506-61-6	Argentate(1-), bis(cyano-C)-, potassium

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00506-61-6	Potassium silver cyanide
00506-61-6	Argentate(1-), dicyano-, potassium
00506-61-6	Silver potassium cyanide
00506-68-3	Cyanogen bromide
00506-68-3	Bromine cyanide
00506-68-3	Cyanogen monobromide
00506-78-5	Iodine cyanide
00506-78-5	Cyanogen iodide
00506-78-5	Iodine monocyanide
00509-14-8	Methane, tetranitro-
00509-14-8	Tetranitromethane
00509-14-8	TNM
00514-73-8	Benzothiazolium, 3-ethyl-2-[5-(3-ethyl-2(3H)-benzothiazolylidene)-1,3-pentadi...
00514-73-8	Dithiazanine iodide
00534-07-6	2-Propanone, 1,3-dichloro-
00534-07-6	Bis(chloromethyl) ketone
00534-07-6	1,3-Dichloroacetone
00534-52-1	Phenol, 2-methyl-4,6-dinitro-
00534-52-1	Dinitrocresol
00534-52-1	DNOC
00535-89-7	4-Pyrimidinamine, 2-chloro-N,N,6-trimethyl-
00535-89-7	Crimidine
00535-89-7	Pyrimidine, 2-chloro-4-(dimethylamino)-6-methyl-
00538-07-8	Ethanamine, 2-chloro-N-(2-chloroethyl)-N-ethyl-
00538-07-8	Ethylbis(2-chloroethyl)amine
00538-07-8	Triethylamine, 2,2'-dichloro-
00541-25-3	Arsonous dichloride, (2-chloroethenyl)-
00541-25-3	Lewisite
00541-25-3	Arsine, dichloro(2-chlorovinyl)-
00541-53-7	Thioimidodicarbonic diamide
00541-53-7	Dithiobiuret
00541-53-7	Biuret, dithio-

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00542-76-7	Propanenitrile, 3-chloro-
00542-76-7	Propionitrile, 3-chloro-
00542-88-1	Methane, oxybis[chloro-
00542-88-1	Chloromethyl ether
00542-90-5	Thiocyanic acid, ethyl ester
00542-90-5	Ethyl thiocyanate
00542-90-5	Ethyl rhodanate
00555-77-1	Ethanamine, 2-chloro-N,N-bis(2-chloroethyl)-
00555-77-1	Triethylamine, 2,2'2"-trichloro-
00555-77-1	Tris(.beta.-chloroethyl)amine
00555-77-1	Tris(2-chloroethyl)amine
00556-61-6	Methane, isothiocyanato-
00556-61-6	Methyl isothiocyanate
00556-61-6	Isothiocyanic acid, methyl ester
00556-64-9	Thiocyanic acid, methyl ester
00556-64-9	Methyl thiocyanate
00558-25-8	Methanesulfonyl fluoride
00563-12-2	Phosphorodithioic acid, S,S'-methylene O,O,O',O'-tetraethyl ester
00563-12-2	Ethion
00563-12-2	O,O,O',O'-Tetraethyl S,S'-methylenebis(phosphorodithioate)
00563-41-7	Hydrazinecarboxamide, monohydrochloride
00563-41-7	Semicarbazide hydrochloride
00563-41-7	Semicarbazide monohydrochloride
00563-41-7	Hydrazinecarboxamide monohydrochloride
00584-84-9	Benzene, 2-4-diisocyanato-1-methyl-
00584-84-9	Toluene 2,4-diisocyanate
00584-84-9	2,4-TDI
00584-84-9	Isocyanic acid, 4-methyl-m-phenylene ester
00584-84-9	Tolylene-2,4-diisocyanate
00594-42-3	Methanesulfenyl chloride, trichloro-
00594-42-3	Perchloromethylmercaptan
00594-42-3	Trichloromethanesulfenyl chloride

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00597-64-8	Stannane, tetraethyl-
00597-64-8	Tetraethyltin
00597-64-8	Tin, tetraethyl-
00614-78-8	Thiourea, (2-methylphenyl)-
00614-78-8	Urea, 2-thio-1-o-tolyl-
00624-83-9	Methane, isocyanato-
00624-83-9	Methyl isocyanate
00624-83-9	Isocyanic acid, methyl ester
00624-92-0	Disulfide, dimethyl
00624-92-0	Methyl disulfide
00625-55-8	Formic acid, 1-methylethyl ester
00625-55-8	Isopropyl formate
00625-55-8	Formic acid, isopropyl ester
00627-11-2	Carbonochloridic acid, 2-chloroethyl ester
00627-11-2	Chloroethyl chloroformate
00627-11-2	Formic acid, chloro-, 2-chloroethyl ester
00627-11-2	2-Chloroethyl chlorocarbonate
00630-60-4	Card-20(22)-enolide, 3-[(6-deoxy-.alpha.-2-mannopyranosyl)oxy]-1,5,11,14,19-...
00630-60-4	Ouabain
00630-60-4	Strophanthin G
00633-03-4	Ethanaminium, N-[4-[[4-(diethylamino)phenyl]phenylmethylene]-2-5-cyclohexad...
00633-03-4	C.I. basic green 1
00633-03-4	Brilliant green
00633-03-4	Ammonium, [4-[p-(diethylamino)-alpha-phenylbenzylidene)-2,5-cyclohexadien-1-...
00639-58-7	Stannane, chlorotriphenyl-
00639-58-7	Triphenyltin chloride
00639-58-7	Chlorotriphenyltin
00640-15-3	Phosphorodithioic acid, S-[2-(ethylthio)ethyl] O,O-dimethyl ester
00640-15-3	Thiometon
00640-15-3	Phosphorodithioic acid, O,O-dimethyl S-(2-ethylthio)ethyl ester
00640-19-7	Acetamide, 2-fluoro-
00640-19-7	Fluoroacetamide

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00640-19-7	Monofluoroacetamide
00644-64-4	Carbamic acid, dimethyl-, 1-[(dimethylamino)carbonyl]-5-methyl-1H-pyrazol-3-y...
00644-64-4	Dimetilan
00644-64-4	Carbamic acid, dimethyl-, ester with 3-hydroxy-N,N,5-trimethylpyrazole-1-carb...
00646-06-0	1,3-Dioxolane
00646-06-0	Ethylene glycol formal
00646-06-0	Dioxolane
00675-14-9	1,3,5-Triazine, 2,4,6-trifluoro-
00675-14-9	Cyanuric fluoride
00675-14-9	s-Triazine, 2,4,6-trifluoro-
00676-97-1	Phosphonic dichloride, methyl-
00676-97-1	Methyl phosphonic dichloride
00696-28-6	Arsonous dichloride, phenyl-
00696-28-6	Phenyl dichloroarsine
00696-28-6	Arsine, dichlorophenyl-
00732-11-6	Phosphorodithioic acid, S-[(1,3-dihydro-1,3-dioxo-2H-isoindol-2-yl)methyl]...
00732-11-6	Phosmet
00732-11-6	Phosphorodithioic acid, O,O-dimethyl ester, S-ester with N-(mercaptomethyl)...
00760-93-0	2-Propenoic acid, 2-methyl-, anhydride
00760-93-0	Methacrylic anhydride
00760-93-0	Methacryloyl anhydride
00786-19-6	Phosphorodithioic acid, S-[(4-chlorophenyl)thio]methyl O,O-diethylester
00786-19-6	Carbophenothion
00814-49-3	Phosphorochloridic acid, diethyl ester
00814-49-3	Diethyl chlorophosphate
00814-49-3	Chlorophosphoric acid, diethyl ester
00814-68-6	2-Propenoyl chloride
00814-68-6	Acrylyl chloride
00814-68-6	Acryloyl chloride
00824-11-3	2,6,7-Trioxa-1-phosphabicyclo[2.2.2]octane, 4...
00824-11-3	1,3-Propanediol, 2-ethyl-2-(hydroxymethyl)-, cyclic phosphite (1:1)
00824-11-3	Trimethylolpropane phosphite

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00919-86-8	Phosphorothioic acid, S-[2-(ethylthio)ethyl] O,O-dimethyl ester
00919-86-8	Demeton-S-methyl
00919-86-8	O,O-Dimethyl S-(ethylmercapto)ethyl thiophosphate
00920-46-7	2-Propenoyl chloride, 2-methyl-
00920-46-7	Methacryloyl chloride
00944-22-9	Phosphonodithioic acid, ethyl-, O-ethyl S-phenyl ester
00944-22-9	Fonofos
00947-02-4	Phosphoramidic acid, 1,3-dithiolan-2-ylidene-, diethyl ester
00947-02-4	Phosfolan
00947-02-4	Imidocarbonic acid, phosphonodithio-, cyclic ethylene P,P-diethyl ester
00950-10-7	Phosphoramidic acid, (4-methyl-1,3-dithiolan-2-ylidene)-, diethyl ester
00950-10-7	Mephosfolan
00950-10-7	Imidocarbonic acid, phosphonodithio-, cyclic propylene P,P-diethyl ester
00950-37-8	Phosphorodithioic acid, S-[(5-methoxy-2-oxo-1,3,4-thiadiazol-3(2H)-yl)methyl...
00950-37-8	Methidathion
00991-42-4	4,7-Methano-1H-isoindole-1,3(2H)-dione, 3a,4,7,7a-Tetrahydro-5-(hydroxyphenyl...
00991-42-4	Norbormide
00991-42-4	5-Norbornene-2,3-dicarboximide, 5-(.alpha.-hydroxy-.alpha.-2-pyridylbenzyl)-7...
00998-30-1	Silane, triethoxy-
00998-30-1	Triethoxysilane
00999-81-5	Ethanaminium, 2-chloro-N,N,N-trimethyl-, chloride
00999-81-5	Chlormequat chloride
00999-81-5	Ammonium, (2-chloroethyl)trimethyl-, chloride
01031-47-6	Phosphonic diamide, P-(5-Amino-3-phenyl-1H-1,2,4-triazol-1-yl)-N,N,N',N'-tetr...
01031-47-6	Triamiphos
01066-45-1	Stannane, chlorotrimethyl-
01066-45-1	Trimethyltin chloride
01066-45-1	Chlorotrimethyltin
01122-60-7	Cyclohexane, nitro-
01122-60-7	Nitrocyclohexane
01124-33-0	Pyridine, 4-nitro-, 1-oxide
01124-33-0	4-Nitropyridine 1-oxide

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01129-41-5	Carbamic acid, methyl-, 3-methylphenyl ester
01129-41-5	Metolcarb
01129-41-5	Carbamic acid, methyl-, m-tolyl ester
01303-28-2	Arsenic oxide (As2O5)
01303-28-2	Arsenic pentoxide
01303-28-2	Arsenic acid
01306-19-0	Cadmium oxide (CdO)
01306-19-0	Cadmium oxide
01314-32-5	Thallium oxide (Tl2O3)
01314-32-5	Thallic oxide
01314-32-5	Dithallium trioxide
01314-32-5	Thallium (III) oxide
01314-56-3	Phosphorus oxide (P2O5)
01314-56-3	Phosphorus pentoxide
01314-56-3	Phosphoric anhydride
01314-62-1	Vanadium oxide (V2O5)
01314-62-1	Vanadium pentoxide
01314-62-1	Vanadic anhydride
01314-84-7	Zinc phosphide (Zn3P2)
01314-84-7	Zinc phosphide
01327-53-3	Arsenic oxide (As2O3)
01327-53-3	Arsenous oxide
01327-53-3	Arsenic trioxide
01331-17-5	Propanol, (2-propenyloxy)-
01331-17-5	Propylene glycol, allyl ether
01331-17-5	Propanol, (allyloxy)-
01335-87-1	Naphthalene, hexachloro-
01335-87-1	Hexachloronaphthalene
01397-94-0	Antimycin A
01397-94-0	Blastmycin
01405-87-4	Bacitracin
01420-07-1	Phenol, 2-(1,1-dimethylethyl)-4,6-dinitro-

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01420-07-1	Dinoterb
01420-07-1	2,4-Dinitro-6-tert-butylphenol
01464-53-5	2,2'-Bioxirane
01464-53-5	Diepoxybutane
01464-53-5	Butane, 1,2:3,4-diepoxy-
01558-25-4	Silane, trichloro(chloromethyl)-
01558-25-4	Trichloro(chloromethyl)silane
01563-66-2	7-Benzofuranol, 2,3-dihydro-2,2-dimethyl-, methylcarbamate
01563-66-2	Carbofuran
01563-66-2	Carbamic acid, methyl-, 2,3-dihydro-2,2-dimethyl-7-benzofuranyl ester
01600-27-7	Acetic acid, mercury(2+) salt
01600-27-7	Mercuric acetate
01600-42-7	Mercury(2+) acetate
01622-32-8	Ethanesulfonyl chloride, 2-chloro-
01622-32-8	.beta.-Chloroethanesulfonyl chloride
01642-54-2	1-Piperazinecarboxamide, N,N-diethyl-4-methyl-, 2-hydroxy-1,2,3-propanetricar...
01642-54-2	Diethylcarbamazine citrate
01642-54-2	1-Piperazinecarboxamide, N,N-diethyl-4-methyl-, citrate (1:1)
01752-30-3	Hydrazinecarbothioamide, 2-(1-methylethylidene)-
01752-30-3	Acetone thiosemicarbazide
01752-30-3	Acetone, thiosemicarbazone
01910-42-5	4,4'-Bipyridinium, 1,1'-dimethyl-, dichloride
01910-42-5	Paraquat
01910-42-5	Methylviologen
01982-47-4	Urea, N'-[4-(4-chlorophenoxy)phenyl]-N,N-dimethyl-
01982-47-4	Urea, 3-[p-(p-chlorophenoxy)phenyl]-1,1-dimethyl-
01982-47-4	Chloroxuron
02001-95-8	Valinomycin
02032-65-7	Phenol, 3,5-dimethyl-4-(methylthio)-, methylcarbamate
02032-65-7	Methiocarb
02032-65-7	Carbamic acid, methyl-, 4-(methylthio)-3,5-xylyl ester
02074-50-2	4,4'-Bipyridinium, 1,1'-dimethyl-, bis(methyl sulfate)

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02074-50-2	Paraquat methosulfate
02074-50-2	Bis(methyl sulfate) salt of paraquat
02097-19-0	2,8,9-Trioxa-5-aza-1-silabicyclo[3.3.3]undecane, 1-phenyl-
02097-19-0	Phenylsilatrane
02104-64-5	Phosphonothioic acid, phenyl-, O-ethyl O-(4-nitrophenyl) ester
02104-64-5	EPN
02104-64-5	Phosphonothioic acid, phenyl-, O-ethyl O-(p-nitrophenyl)ester
02223-93-0	Octadecanoic acid, cadmium salt
02223-93-0	Cadmium stearate
02223-93-0	Stearic acid, cadmium salt
02231-57-4	Carbonothioic dihydrazide
02231-57-4	Thiocarbazide
02231-57-4	Carbohydrazide, thio-
02231-57-4	Thiocarbonic dihydrazide
02235-25-8	Mercurate(2-), ethyl[phosphato(3-)-O]-, dihydrogen
02235-25-8	Ethylmercuric phosphate
02235-25-8	Mercury, (dihydrogen phosphato)ethyl-
02235-25-8	Ethylmercury phosphate
02238-07-5	Oxirane, 2,2'-[oxybis(methylene)bis-
02238-07-5	Diglycidyl ether
02244-16-8	2-Cyclohexen-1-one, 2-methyl-5-(1-methylethenyl)-, (S)-
02244-16-8	Carvone
02244-16-8	p-Mentha-6,8-dien-2-one, (S)-(+)-
02275-18-5	Phosphorodithioic acid, O,O-diethyl S-[2-[(1-methylethyl)amino]-2-oxoethyl]...
02275-18-5	Prothoate
02275-18-5	Phosphorodithioic acid, O,O-diethyl ester, S-ester with N-isopropyl-2-mercapt...
02497-07-6	Phosphorodithioic acid, O,O-diethyl S-[2-(ethylsulfinyl)ethyl] ester
02497-07-6	Oxydisulfoton
02524-03-0	Phosphorochloridothioic acid, O,O-dimethyl ester
02524-03-0	Dimethyl phosphorochloridothioate
02540-82-1	Phosphorodithioic acid, S-[2-(formylmethylamino)-2-oxoethyl] O,O-dimethyl ester
02540-82-1	Formothion

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02540-82-1	Phosphorodithioic acid, O,O-dimethyl ester, S-ester with N-formyl-2-mercapto-...
02570-26-5	1-Pentadecanamine
02570-26-5	Pentadecylamine
02570-26-5	1-Aminopentadecane
02631-37-0	Phenol, 2-methyl-5-(1-methylethyl)-, methylcarbamate
02631-37-0	Promecarb
02631-37-0	Carbamic acid, methyl-, m-cym-5-yl ester
02636-26-2	Phosphorothioic acid, O-(4-cyanophenyl) O,O-dimethyl ester
02636-26-2	Cyanophos
02636-26-2	Phosphorothioic acid, O,O-dimethyl ester, O-ester with p-hydroxybenzonitrile
02642-71-9	Phosphorodithioic acid, O,O-diethyl S-[(4-oxo-1,2,3-benzotriazin-3(4H)-yl)met...
02642-71-9	Azinphos-ethyl
02642-71-9	Phosphorodithioic acid, O,O-diethyl ester, S-ester with 3-(mercaptomethyl)-1,...
02665-30-7	Phosphonothioic acid, methyl-, O-(4-nitrophenyl...
02703-13-1	Phosphonothioic acid, methyl-, O-ethyl O-[4-...
02757-18-8	Propanedioic acid, dithallium salt
02757-18-8	Thallous malonate
02757-18-8	Malonic acid, dithallous salt
02763-96-4	3(2H)-Isoxazolone, 5-(aminomethyl)-
02763-96-4	Muscimol
02763-96-4	5-aminomethyl-3-hydroxyisoxazole
02778-04-3	Phosphorothioic acid, S-[(5-methoxy-4-oxo-4H-pyran-2-yl)methyl] O,O-di...
02778-04-3	Endothion
02778-04-3	Phosphorothioic acid, O,O-dimethyl ester, S-ester with 2-(mercaptomethyl)-5-...
03037-72-7	1-Butanamine, 4-(diethoxymethylsilyl)-
03037-72-7	Silane, (4-aminobutyl)diethoxymethyl-
03037-72-7	Butylamine, 4-(diethoxymethylsilyl)-
03048-64-4	Bicyclo[2.2.1]hept-2-ene, 5-ethenyl-
03048-64-4	Vinylnorbornene
03048-64-4	2-Norbornene, 5-vinyl-
03254-63-5	Phosphoric acid, dimethyl 4-(methylthio)phenyl...
03254-63-5	Dimethyl p-(methylthio)phenyl phosphate

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03569-57-1	Sulfoxide, 3-chloropropyl octyl
03689-24-5	Thiodiphosphoric acid ([(HO)2P(S)]2O), tetraethyl ester
03689-24-5	Sulfotep
03689-24-5	Thiopyrophosphoric acid ([(HO)2P(S)]2O), tetraethyl ester
03691-35-8	1H-Indene-1,3(2H)-dione, 2-[(4-chlorophenyl)phenylacetyl]-
03691-35-8	Chlorophacinone
03691-35-8	1,3-Indandione, 2-[(p-chlorophenyl)phenylacetyl]-
03734-97-2	Phosphorothioic acid, S-[2-(diethylamino)ethyl] O,O-dimethyl ester,...
03734-97-2	Amiton oxalate
03734-97-2	Phosphorothioic acid, S-[2-(diethylamino)ethyl] O,O-diethyl ester, oxalate (1:1)
03735-23-7	Phosphorodithioic acid, S-[[(2,5-dichlorophenyl)thio]methyl] O,O-dimethyl ester
03735-23-7	Methyl phenkapton
03878-19-1	1H-Benzimidazole, 2-(2-furanyl)-
03878-19-1	Fuberidazole
03878-19-1	Benzimidazole, 2-(2-furyl)-
03878-19-1	2-(2-Furyl)benzimidazole
04044-65-9	Benzene, 1,4-diisothiocyanato-
04044-65-9	Bitoscanate
04044-65-9	Isothiocyanic acid, p-phenylene ester
04098-71-9	Cyclohexane, 5-isocyanato-1-(isocyanatomethyl)-1,3,3-trimethyl-
04098-71-9	Isophorone diisocyanate
04098-71-9	Isocyanic acid, methylene(3,5,5-trimethyl-3,1-cyclohexylene) ester
04104-14-7	Phosphoramidothioic acid, (1-iminoethyl)-, O,O-bis(4-chlorophenyl) ester
04104-14-7	Phosacetim
04104-14-7	Phosphoramidothioic acid, acetimidoyl-, O,O-bis(p-chlorophenyl) ester
04170-30-3	2-Butenal
04170-30-3	Crotonaldehyde
04170-30-3	Crotylaldehyde
04301-50-2	[1,1'-Biphenyl]-4-acetic acid, 2-fluoroethyl ester
04301-50-2	Fluenetil
04301-50-2	4-Biphenylacetic acid, 2-fluoroethyl ester
04418-66-0	Phenol, 2,2'-thiobis(4-chloro-6-methyl-

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04418-66-0	o-Cresol, 6,6'-thiobis[4-chloro-
04835-11-4	1,6-Hexanediamine, N,N'-dibutyl-
04835-11-4	Hexamethylenediamine, N,N'-dibutyl-
04835-11-4	N,N'-Dibutylhexamethylenediamine
05281-13-0	1,3-Benzodioxole, 5-[bis[2-(2-butoxyethoxy)ethoxy]methyl]-
05281-13-0	Piprotal
05281-13-0	Piperonal bis[2-(2-butoxyethoxy)ethyl] acetal
05344-82-1	Thiourea, (2-chlorophenyl)-
05344-82-1	Urea, 1-(o-chlorophenyl)-2-thio-
05836-29-3	2H-1-Benzopyran-2-one, 4-hydroxy-3-(1,2,3,4-tetrahydro-1-naphthalenyl)-
05836-29-3	Coumatetralyl
05836-29-3	Coumarin, 4-hydroxy-3-(1,2,3,4-tetrahydro-1-naphthyl)-
06533-73-9	Carbonic acid, dithallium(1+) salt
06533-73-9	Thallous carbonate
06533-73-9	Carbonic acid, thallium(1+) salt
06923-22-4	Phosphoric acid, dimethyl 1-methyl-3-(methylamino)-3-oxo-1-propenyl ester, (E)-
06923-22-4	Monocrotophos
06923-22-4	Phosphoric acid, dimethyl ester, ester with 3-hydroxy-N-methylcrotonamide, (E)-
07440-02-0	Nickel
07440-48-4	Cobalt
07446-11-9	Sulfur trioxide
07446-11-9	Sulfuric anhydride
07446-18-6	Sulfuric acid, dithallium(1+) salt
07446-18-6	Thallous sulfate
07446-18-6	Thallium(I)sulfate
07487-94-7	Mercury chloride (HgCl2)
07487-94-7	Mercuric chloride
07487-94-7	Mercury (II) chloride
07487-94-7	Corrosive sublimate
07550-45-0	Titanium chloride (TiCl4), (T-4)-
07550-45-0	Titanium tetrachloride
07550-45-0	Titanium chloride (TiCl4)

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07580-67-8	Lithium hydride (LiH)
07580-67-8	Lithium hydride
07580-67-8	Lithium monohydride
07631-89-2	Arsenic acid (H3AsO4), sodium salt
07631-89-2	Sodium arsenate
07631-89-2	Arsenic acid, sodium salt
07637-07-2	Borane, trifluoro-
07637-07-2	Boron trifluoride
07637-07-2	Boron fluoride (BF3)
07664-39-3	Hydrofluoric acid
07664-39-3	Hydrogen fluoride
07664-93-9	Sulfuric acid
07697-37-2	Nitric acid
07719-12-2	Phosphorus trichloride
07723-14-0	Phosphorus
07723-14-0	Black phosphorus
07723-14-0	Phosphorus (white)
07723-14-0	Phosphorus (yellow)
07723-14-0	Phosphorus (red)
07723-14-0	Violet Phosphorus
07778-44-1	Arsenic acid (H3AsO4), calcium salt (2:3)
07778-44-1	Calcium arsenate
07778-44-1	Arsenic acid, calcium salt (2:3)
07782-41-4	Fluorine
07782-50-5	Chlorine
07783-00-8	Selenious acid (H2SeO3)
07783-00-8	Selenous acid
07783-07-5	Hydrogen selenide
07783-07-5	Dihydrogen selenide
07783-60-0	Sulfur fluoride (SF4), (T-4)-
07783-60-0	Sulfur tetrafluoride
07783-70-2	Antimony fluoride (SbF5)

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07783-70-2	Antimony pentafluoride
07783-80-4	Tellurium fluoride (TeF6), (OC-6-11)-
07783-80-4	Tellurium hexafluoride
07784-34-1	Arsenous trichloride
07784-34-1	Arsenic chloride
07784-42-1	Arsine
07784-42-1	Arsenic hydride
07784-42-1	Hydrogen arsenide
07784-46-5	Arsenenous acid, sodium salt
07784-46-5	Sodium arsenite
07784-46-5	Arsenious acid, sodium salt
07786-34-7	2-Butenoic acid, 3-[(dimethoxyphosphinyl)oxy]-, methyl ester
07786-34-7	Mevinphos
07786-34-7	Crotonic acid, 3-hydroxy-, methyl ester, dimethyl phosphate
07791-12-0	Thallium chloride (TlCl)
07791-12-0	Thallous chloride
07791-23-3	Seleninyl chloride
07791-23-3	Selenium oxychloride
07791-23-3	Selenium oxydichloride
07803-51-2	Phosphine
08001-35-2	Toxaphene
08001-35-2	Camphechlor
08023-53-8	Tetrosan
08023-53-8	Dichlorobenzalkonium chloride
08023-53-8	Ammonium chloride, alkyl(C8-C18)dimethyl-3,4-dichlorobenzyl-
08065-48-3	Phosphorothioic acid, O,O-diethyl O-[2-(ethylthio)ethyl] ester, mixed with...
08065-48-3	Demeton
10025-65-7	Platinum chloride (PtCl2)
10025-65-7	Platinous chloride
10025-65-7	Platinum dichloride
10025-73-7	Chromium chloride (CrCl3)
10025-73-7	Chromic chloride

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10025-73-7	Chromium trichloride
10025-87-3	Phosphoryl chloride
10025-87-3	Phosphorus oxychloride
10025-87-3	Phosphorus oxytrichloride
10025-97-5	Iridium chloride (IrCl4)
10025-97-5	Iridium tetrachloride
10025-97-5	Iridic chloride
10026-13-8	Phosphorane, pentachloro-
10026-13-8	Phosphorus pentachloride
10026-13-8	Phosphoric chloride
10028-15-6	Ozone
10031-59-1	Sulfuric acid, thallium salt
10031-59-1	Thallous sulfate
10031-59-1	Thallium sulfate
10049-07-7	Rhodium chloride (RhCl3)
10049-07-7	Rhodium trichloride
10049-07-7	Trichlororhodium
10102-18-8	Selenious acid (H2SeO3), disodium salt
10102-18-8	Sodium selenite
10102-18-8	Selenious acid, disodium salt
10102-18-8	Disodium selenite
10102-20-2	Telluric acid (H2TeO3), disodium salt
10102-20-2	Sodium tellurite
10102-20-2	Tellurous acid (H2TeO3), disodium salt
10102-43-9	Nitrogen oxide (NO)
10102-43-9	Nitric oxide
10102-44-0	Nitrogen oxide
10102-44-0	Nitrogen dioxide
10124-50-2	Arsonic acid, potassium salt
10124-50-2	Potassium arsenite
10124-50-2	Arsenious acid, potassium salt
10140-87-1	Ethanol, 1,2-dichloro-, acetate

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10140-87-1	1,2-Dichloroethyl acetate
10210-68-1	Cobalt, di-.mu.-carbonylhexacarbonyldi-, (Co-Co)
10210-68-1	Cobalt carbonyl
10210-68-1	Dicobalt octacarbonyl
10265-92-6	Phosphoramidothioic acid, O,S-dimethyl ester
10265-92-6	Methamidophos
10265-92-6	O,S-Dimethyl phosphoramidothioate
10294-34-5	Borane, trichloro-
10294-34-5	Boron trichloride
10294-34-5	Boron chloride [BCl3]
10311-84-9	Phosphorodithioic acid, S-[2-chloro-1-(1,3-dihydro-1,3-dioxo-2H-isoindol-2-yl...
10311-84-9	Dialifos
10311-84-9	Phosphorodithioic acid, O,O-diethyl ester, S-ester with N-(2-chloro-1-mercapt...
10476-95-6	2-Propene-1,1-diol, 2-methyl-, diacetate
10476-95-6	Methacrolein diacetate
10476-95-6	Acetic acid, 2-methyl-2-propene-1,1-diol diester
12002-03-8	CI pigment green 21
12002-03-8	Paris green
12002-03-8	Copper aceto-arsenite
12108-13-3	Manganese, tricarbonyl[(1,2,3,4,5-(.eta.)-1-methyl-2,4-cyclopentadien-1-yl]-
12108-13-3	Manganese, tricarbonyl methylcyclopentadienyl
12108-13-3	Manganese, tricarbonyl(methyl-.pi.-cyclopentadienyl)-
12108-13-3	Methylcymantrene
12108-13-3	MMT
13071-79-9	Phosphorodithioic acid, S-[[(1,1-dimethylethyl)thio]methyl] O,O-diethyl ester
13071-79-9	Terbufos
13071-79-9	Phosphorodithioic acid, S-[(tert-butylthio)methyl] O,O-diethyl ester
13171-21-6	Phosphoric acid, 2-chloro-3-(diethylamino)-1-methyl-3-oxo-1-propenyldimet...
13171-21-6	Phosphamidon
13171-21-6	Phosphoric acid, dimethyl ester, ester with 2-chloro-N,N-diethyl-3-hydroxycro...
13194-48-4	Phosphorodithioic acid, O-ethyl S,S-dipropyl ester
13194-48-4	Ethoprophos

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13194-48-4	O-Ethyl S,S-dipropyl phosphorodithioate
13410-01-0	Selenic acid (H2SeO4), disodium salt
13410-01-0	Sodium selenate
13410-01-0	Disodium selenate
13450-90-3	Gallium chloride (GaCl3)
13450-90-3	Gallium trichloride
13454-96-1	Platinum chloride (PtCl4), (SP-4-1)-
13454-96-1	Platinum tetrachloride
13454-96-1	Platinum (IV) chloride
13463-39-3	Nickel carbonyl [Ni(CO)4], (T-4)-
13463-39-3	Nickel carbonyl
13463-39-3	Nickel tetracarbonyl
13463-40-6	Iron carbonyl (Fe(CO)5), (TB-5-11)-
13463-40-6	Iron, pentacarbonyl-
13463-40-6	Pentacarbonyliron
13494-80-9	Tellurium
14167-18-1	Cobalt, [[2,2'-[1,2-ethanediylbis(nitrilomethylidyne]bis[phenolato]](2-)-N,N'...
14167-18-1	Salcomine
15271-41-7	Bicyclo[2.2.1]heptane-2-carbonitrile, 5-chloro...
15271-41-7	2-Norbornanecarbonitrile, 5-chloro-6-oxo-, O-(methylcarbamoyl)oxime,(E)...
15271-41-7	2-exo-Chloro-6-endo-cyano-2-norbornanone O-(methylcarbamoyl)oxime
16752-77-5	Ethanimidothioic acid, N-[[(methylamino)carbonyl]oxy]-, methyl ester
16752-77-5	Methomyl
16752-77-5	Acetimidic acid, thio-N-[(methylcarbamoyl)oxy]-, methyl ester
16919-58-7	Platinate(2-), hexachloro-, diammonium, (OC-6-11)
16919-58-7	Ammonium chloroplatinate
16919-58-7	Diammonium hexachloroplatinate(2-)
17702-41-9	Decaborane(14)
17702-57-7	Methanimidamide, N,N-dimethyl-N'-[2-methyl-4-[[(methylamino)carbonyl]oxy]phen...
17702-57-7	Formparanate
17702-57-7	Carbamic acid, methyl-, ester with N'-(4-hydroxy-o-tolyl)-N,N-dimethylformami...
19287-45-7	Diborane (6)

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19287-45-7	Diborane
19624-22-7	Pentaborane (9)
19624-22-7	Pentaborane
20816-12-0	Osmium oxide (OsO4), (T-4)-
20816-12-0	Osmium tetroxide
20816-12-0	Osmic acid anhydride
20830-75-5	Card-20(22)-enolide, 3-[(O-2,6-dideoxy-.beta.-D-ribo-hexopyranosyl-(1...
20830-75-5	Digoxin
20859-73-8	Aluminum phosphide (AlP)
20859-73-8	Aluminum phosphide
21548-32-3	Phosphoramidic acid, 1,3-dithietan-2-ylidene-, diethyl ester
21548-32-3	Fosthietan
21564-17-0	Thiocyanic acid, (2-benzothiazolylthio)methyl ester
21564-17-0	Benzothiazole, 2-[(thiocyanatomethyl)thio]-
21609-90-5	Phosphonothioic acid, phenyl-, O-(4-bromo-2,5-dichlorophenyl) O-methyl ester
21609-90-5	Leptophos
21908-53-2	Mercury oxide (HgO)
21908-53-2	Mercuric oxide
21908-53-2	Mercury (II) oxide
21923-23-9	Phosphorothioic acid, O-[2,5-dichloro-4-(methylthio)phenyl] O,O-diethyl ester
21923-23-9	Chlorthiophos
21923-23-9	Phosphorothioic acid, O,O-diethyl O-[(2,5-dichloro-4-methylthio)phenyl] ester
22224-92-6	Phosphoramidic acid, (1-methylethyl)-, ethyl [3-methyl-4-(methylthio)phenyl]...
22224-92-6	Fenamiphos
22224-92-6	Phosphoramidic acid, isopropyl-, 4-(methylthio)-m-tolyl ethyl ester
23135-22-0	Ethanimidothioic acid, 2-(dimethylamino)-N-[[(methylamino)carbonyl]oxy]-2-oxo...
23135-22-0	Oxamyl
23135-22-0	Oxamimidic acid, N',N'-dimethyl-N-[(methylcarbamoyl)oxy]-1-thio-, methyl ester
23422-53-9	Methanimidamide, N,N-dimethyl-N'-[3-[[(methylamino)carbonyl]oxy]phenyl-...
23422-53-9	Formetanate
23422-53-9	Carbamic acid, methyl-, ester with N'-(m-hydroxyphenyl)-N,N-dimethylformamid...
23505-41-1	Phosphorothioic acid, O-[2-(diethylamino)-6-methyl-4-pyrimidinyl] O,O-diethyl...

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23505-41-1	Pirimifos-ethyl
24017-47-8	Phosphorothioic acid, O,O-diethyl O-(1-phenyl-1H-1,2,4-triazol-3-yl) ester
24017-47-8	Triazofos
24017-47-8	1-Phenyl-1,2,4-triazolyl-3-(O,O-diethyl thionophosphate)
24017-47-8	1-Phenyl-3-(O,O-diethyl thionophosphoryl)-1,2,4-triazole
24934-91-6	Phosphorodithioic acid, S-(chloroethyl) O,O-diethyl ester
24934-91-6	Chlormephos
24934-91-6	S-(Chloromethyl) O,O-diethyl phosphorodithioate
26419-73-8	1,3-Dithiolane-2-carboxaldehyde, 2,4-dimethyl-, O-(methylcarbamoyl)oxime
26419-73-8	Carbamic acid, methyl-, O-[[(2,4-dimethyl...
26628-22-8	Sodium azide (Na(N3))
27137-85-5	Silane, trichloro(dichlorophenyl)-
27137-85-5	Trichloro(dichlorophenyl)silane
28347-13-9	Benzene, bis(chloromethyl)-
28347-13-9	Xylylene dichloride
28347-13-9	Xylene, .alpha.,.alpha.'-dichloro-
28772-56-7	2H-1-Benzopyran-2-one, 3-[3-[4'[bromo[1,1'-biphenyl]-4-yl]-3-hydroxy-1-phenyl...
28772-56-7	Bromadiolone
28772-56-7	Coumarin, 3-[3-(4'-bromo-1,1'-biphenyl-4-yl)-3-hydroxy-1-phenylpropyl]-4-...
30674-80-7	2-Propenoic acid, 2-methyl-, 2-isocyanatoethyl ester
30674-80-7	Methacryloyloxyethyl isocyanate
39196-18-4	2-Butanone, 3,3-dimethyl-1-(methylthio)-, O-[(methylamino)carbonyl]oxime
39196-18-4	Thiofanox
39196-18-4	3,3-dimethyl-1-(methylthio)-2-butanone-O-[(methylamino)carbonyl]oxime
50782-69-9	Phosphonothioic acid, methyl-, S-[2-[bis...
53558-25-1	Urea, N-(4-nitrophenyl)-N'-(3-pyridinylmethyl)-
53558-25-1	Pyriminil
53558-25-1	Urea, 1-nitrophenyl-3-(3-pyridylmethyl)-
58270-08-9	Zinc, dichloro[4,4-dimethyl-5-[[[(methylamino)...
62207-76-5	Cobalt, [[2,2'-[1,2-ethanediylbis(nitrilomethy...
62207-76-5	Cobalt (II), N,N'-ethylenebis(3-fluorosalicylideneiminato)-
PMN-82-147	Organorhodium complex

APPENDIX A

Correction to the List of Acutely Toxic Chemicals

1. Based on information analyzed during the development of the profiles, the chemical listed as Phenarsazine oxide, CAS number 58-36-6 should be listed as Phenoxarsine, 10, 10'-oxidi, CAS number 58-36-6 (no change).

2. Based on additional analyses of the toxicity information used to identify "Other Chemicals," the following changes are made.

   a. Ammonia, propylene oxide, sulphur dioxide, and vinyl acetate monomer do not have acute toxicity measures that strictly meet the criteria for listing as "Other Chemicals." However, based on production capacity, toxicity, and known danger, these chemicals remain listed as "Other Chemicals." Only the reason for listing is changed.

   b. Cumene, isopropanol, and methanol are removed from the list based on the relatively lesser toxicity of these chemicals compared to all of the acutely toxic chemicals listed.

3. The CAS number for Nickel is incorrectly stated on the list of acutely toxic chemicals. The CAS number 7440-02-2 should be stated as 7440-02-0.

OTHER CHEMICALS

NAME	CAS NUMBER
Acrylamide	79-06-1
Acrylonitrile	107-13-1
Adiponitrile	111-69-3
Ammonia	7664-41-7
Aniline	62-53-3
Bromine	7726-95-6
Carbon disulfide	75-15-0
Chloroform	67-66-3
Cumene	98-82-8
Cyclohexylamine	108-91-8
Epichlorohydrin	106-89-8
Ethylene oxide	75-21-8
Formaldehyde	50-00-0
Hydrochloric acid	7647-01-0
Hydrogen peroxide	7722-84-1
Hydrogen sulfide	7783-06-4
Hydroquinone	123-31-9
Isopropanol	67-63-0
Methanol	67-56-1
Methyl bromide	74-83-9
Nitrobenzene	98-95-3
Phosgene	75-44-5
Propylene oxide	75-56-9
Sulfur dioxide	7446-09-5
Tetramethyl lead	75-74-1
Vinyl acetate monomer	108-05-4

APPENDIX B

GLOSSARY

Accident Site	The location of an unexpected occurrence, failure, or loss, either at a plant or along a transport route, resulting in a release of hazardous materials.
Acutely Toxic Chemicals	Chemicals which can cause both severe short- and long-term health effects after a single, brief exposure (short duration). These chemicals can cause damage to living tissue, impairment of the central nervous system, severe illness or in extreme cases, death when ingested, inhaled, or absorbed through the skin.
By-Product	Material produced or generated in an industrial process in addition to the principal product.
Chemical Process	A particular method of manufacturing or making a chemical, usually involving a number of steps or operations.
Combustion Product	Material produced or generated during the burning or oxidation of a material.
Command Post	Facility at a safe distance upwind from an accident site, where the on-scene coordinator, responders and technical representatives can make response decisions, deploy manpower and equipment, maintain liaison with media, and handle communications.
Contingency Plan	A document developed to identify and catalog all the elements required to respond to an emergency, to define responsibilities and specific tasks, and to serve as a response guide.
Decomposition Product	Material produced or generated by the physical or chemical degradation of a parent material.
Disposal	The removal of waste material to a site or facility specifically designed and permitted to receive such wastes.
Emergency	A situation created by an accidental release or spill of hazardous chemicals which poses a threat to the safety of workers, residents, the environment, or property.
Evacuation	Removal of residents from an area of danger.
Hazard	Any situation that has the potential for doing damage to life, property, and/or the environment.

GLOSSARY (continued)

Hazardous Chemical	A chemical which is explosive, flammable, poisonous, corrosive, reactive, or radioactive and requires special care in handling because of the hazards it poses to public health and the environment.
Off-Scene Support	Assistance (via telephone, radio, or computer) from technical persons, agencies, shippers, responders, etc. not at the accident site.
On-Scene Coordinator	The official in charge of a Federally financed response action.
Plume	A vapor cloud formation which has shape and buoyancy.
Response	The efforts to minimize the risks created in an emergency by protecting the people, the environment, and property and returning the scene to normal pre-emergency conditions.
Risk	The probability that damage to life, property, and/or the environment will occur if a hazard manifests itself.
Simulation	A mock accident or release set up to test emergency response methods or for use as a training tool.
Site/Facility	Any location where acutely toxic chemicals are manufactured, processed, stored, handled, used, or disposed; in short, any place where these chemicals may be found. Communities should be aware that chemicals are frequently found at places other than industrial sites.
Special Populations	Concentrations of people in one area or building for a special purpose or in certain circumstances (e.g., schools, hospitals, nursing homes, orphanages, shopping centers).
Storage	Methods of keeping raw materials, finished goods, or products while awaiting use, shipment, or consumption.
Transfer	Loading and unloading of chemicals between transport vehicles and storage vessels, and sending chemicals via pipes between storage vessels and process reactors.
Transport	To carry or convey goods from one place to another using ships, trucks, trains, pipelines, or airplanes.

GLOSSARY (continued)

Transport Mode	Method of transportation: highway (trucks); rail (trains); water (ships/barges); pipelines; air (planes).
Vapor Dispersion	The movement of vapor clouds in air due to wind, gravity spreading, and mixing.

APPENDIX C

ACRONYMS

AAR/BOE	Association of American Railroads/Bureau of Explosives
AIChE	American Institute of Chemical Engineers
ASME	American Society of Mechanical Engineers
ASSE	American Society of Safety Engineers
CDC	Centers for Disease Control
CHEMTREC	Chemical Transportation Emergency Center (800/424-9300, District of Columbia: 202-483-7616)
CHLOREP	Chlorine Emergency Plan
CHRIS/HACS	Chemical Hazards Response Information System/Hazard Assessment Computer System
EPA	Environmental Protection Agency
ER	Emergency Response
FEMA	Federal Emergency Management Agency
HMTC	Hazardous Materials Technical Center
IDLH	Immediately Dangerous to Life or Health
IEMS	Integrated Emergency Management System
NIOSH	National Institute for Occupational Safety and Health
NRC	National Response Center (800-424-8802, District of Columbia: 202-426-2675)
OHMTADS	Oil and Hazardous Materials Technical Assistance Data System
OSC	On-Scene Coordinator
OSHA	Occupational Safety and Health Administration
PSTN	Pesticide Safety Team Network
USCG	United States Coast Guard

APPENDIX D

QUANTITY DETERMINATION METHOD

This appendix describes a method that can be used to assign priorities for assessing the potential risk from a variety of separate, local activities involving acutely toxic chemicals (see Section 3.3B). This method is not designed to provide an upper exposure limit for the release of a certain amount of an acutely toxic chemical, nor is it designed to be used to establish a "maximum allowable" release amount for setting limits for storage or release under an ordinance or regulation. The intended use of this methodology is as a screening tool to help the work group determine which sites in their community pose the greatest potential for causing death and irreversible injury should an accidental release of an acutely toxic chemical occur. Communities are invited to contact their Regional Office of EPA for more detailed assistance on airborne contaminant modelling for purposes of developing specific levels, target populations, or evacuation areas as part of contingency planning. More sophisticated models that account for the specific area meteorology, topography, and specific physical/chemical properties of the acutely toxic chemical may be available for these purposes.

D.1 BACKGROUND

EPA believes that communities may need assistance in determining whether enough of an acutely toxic chemical is present on a site to cause death or irreversible injuries in the community, if an accidental release occurred. Many mathematical models (which require computer capabilities to run) available for determining the downwind concentration of a release into the air could be used for this determination. However, these models are very complex, not easily used, and not all are appropriate for accidental releases into air. In addition, each site is unique in topography, weather conditions, and distance to the community, and each chemical has its own unique characteristics and behavior.

Since it is not reasonable to expect each community to have the expertise to develop a model simulation for every situation that might occur, EPA developed this method for use as a screening tool. Using an EPA model known as INPUFF (which simulates dispersion of a puff of vapor from an instantaneous source), EPA performed an analysis based on reasonable worst case conditions (like low wind speeds, ground level release, limited mixing, and ambient temperature conditions) for an accidental release occurring at any site. (INPUFF is part of EPA's airborne contaminant modelling system.) Model conditions were set to simulate a rupture or large spill from which a large cloud of material would be quickly generated. The highest 30 minute average concentration at downwind distances ranging from 100 feet to 10 miles was calculated using the model for airborne releases associated with various quantities of chemicals over varying meteorological conditions. Other assumptions in the model include a release point 3 feet above the ground at ambient temperature (higher temperatures cause the vapor cloud to rise and result in lower concentrations in the air), and a release time of 1 minute duration. The one minute release was selected because it generated the highest concentration in air per quantity of chemical released. The results of these model simulations were arranged in the form of a graph that can be easily used. The method for using the graph is described below in Section D.3. Note, however, that the method has significant limitations and remember that the quantity determination should be made in light of the kind of activities at each particular site associated with acutely toxic chemicals. The graph is useful for determining the quantity needed to reach a level of concern as the result of a catastrophic release of a gas, volatile liquid, or chemicals under high temperature or pressure that can become quickly airborne under accident conditions. This method tends to overestimate the concentration (i.e., less quantity needed to reach IDLH) for those situations where the chemical has low volatility (high boiling point) or is stored under ambient conditions. The method may underestimate the concentration (i.e., more quantity needed to reach IDLH) for very dense vapors like chlorine or ammonia that may behave differently upon accidental release. The graph is designed to be as conservative as possible to allow the work group to focus on the situations most likely to cause death or irreversible health effects.

D.2 METHODOLOGY

To use the graph to determine whether there is enough acutely toxic chemical on a site to generate airborne concentrations that could reach a level of concern beyond the site fence line, three pieces of information are needed: (1) the distance from the point where the acutely toxic chemical could be released on site to the nearest site fence line or the nearest population; (2) the molecular weight of the acutely toxic chemical; and (3) the level of concern for the chemical. The distance can be determined from maps or from discussions with a technical contact at the site. The molecular weight of the chemical may be found on the chemical profile sheet or, if the chemical is not on the EPA list, from the site technical contact.

Several health effects levels are generally available for use as the level of concern. To identify only those sites where accidental releases of acutely toxic chemicals have the potential to result in death or irreversible injury, the level of concern should be taken as the IDLH level (Immediately Dangerous to Life and Health). This level (established by the National Institute for Occupational Safety and Health) represents the maximum level to which a healthy worker can be exposed for 30 minutes and escape without suffering irreversible health effects or escape impairing symptoms. The chemical profiles will include IDLH values, when available.

There are problems inherent in using the IDLH as a measure of the level of concern:

- The IDLH is based upon the response of the healthy, male worker population and does not take into account exposure of more sensitive individuals such as the elderly, children, or people with various health problems;

- The IDLH is based upon a 30 minute exposure time frame which may not be realistic for accidental airborne releases;

- IDLH values do not exist for all acutely toxic chemicals; and

- By using the IDLH as the level of concern, this methodology may not identify all quantities of concern that could result in serious but reversible injury.

Thus, IDLH values used in this way do not necessarily indicate "safe levels," and a working group using them for screening purposes may wish to make appropriate allowances, e.g., for sensitive populations (such as the elderly) that may live close to the site boundary.

If the acutely toxic chemical you are evaluating does not have an IDLH in the Profile or there is no profile available on the substance, use the lowest LC_{LO} value which may be obtained from the site technical contact or from published toxicology sources. The LC_{LO} is the lowest lethal concentration observed in tests on laboratory animals. If an LC_{LO} is not available, use the lowest LC_{50} value divided by 10 for the chemical. The LC_{50} is the level for which 50 percent of the test animals died when exposed for a specified time period. This value may also be obtained from the Profiles, the site contact, or toxicological literature. The LC_{50} value should be reduced by a factor of 10 to better approximate the level for an IDLH.

If no LC_{LO} or LC_{50} data are available, use the lowest LD_{LO} oral and then the lowest LD_{50} oral values reduced by a factor of 10. The LD values represent the lethal dose via the oral route and will need to be converted to inhalation doses as described below.

Once the level of concern (IDLH, LC_{LO}, or LC_{50}) is known, it can be used on the graph to determine quantity as long as it is converted or in the form of g/m^3. Inhalation toxicity levels may be given in units of parts per million (ppm), milligrams per cubic meter (mg/m^3), milligrams per liter (mg/l), or grams per liter (g/l). The graph in Figure D-1 uses the units of g/m^3, so any other units, such as ppm, must be converted to g/m^3 before using the graph. Levels given in parts per million can be converted to grams per cubic meter (g/m^3) as follows:

$$\text{Level of Concern (in } g/m^3) = \frac{\text{Toxicity Level (in ppm)}}{1000} \times \frac{MW}{24.5}$$

where MW is the substance molecular weight. For example, chlorine has a level of concern (IDLH) of 25 ppm and a molecular weight of about 71. Thus the level of concern in grams per cubic meter is:

$$\text{Level of Concern (in } g/m^3) = \frac{25}{1000} \times \frac{71}{24.5} = 0.07\ g/m^3$$

An inhalation toxicity level of concern given in milligrams per cubic meter (mg/m^3) can be converted to g/m^3 as follows:

$$\text{Level of Concern (in } g/m^3) = \frac{\text{Toxicity Level (in } mg/m^3)}{1000}$$

An inhalation toxicity level of concern given in grams per liter (g/l) can be converted to g/m^3 as follows:

$$\text{Level of Concern (in } g/m^3) = \text{Toxicity Level (in } g/l) \times 1000$$

An inhalation toxicity level of concern given in milligrams per liter (mg/l) can be converted to g/m^3 as follows:

$$\text{Level of Concern (in } g/m^3) = \text{Toxicity Level (in } mg/l)$$

D.3 USING THE GRAPH

Once the level of concern in grams per cubic meter and the distance in feet are known, use the graph to determine the quantity. Using the left-hand scale on the graph, mark the proper value for the level of concern for the chemical you are considering. For example, chlorine should have a mark at 0.07. Next, move to the center scale and mark the distance from the source of release to the site fence line or to a particular target of concern such as a hospital or nursing home. Using a ruler or other straight-edge, draw a straight line from the mark on the left scale through the mark on the center scale to the scale on the right. Where the line hits the scale on the right is the quantity of chemical that would result in the concentration on the left scale at the distance on the center scale if it were all released. For example, using chlorine, if a distance of 200 feet were used, the quantity given on the right scale would be about 2.5 pounds. In other words, if 2.5 pounds of chlorine were released under poor meteorological and wind conditions, potentially lethal levels of chlorine could be found at a distance up to 200 feet away.

The procedures and example given above are appropriate for vapors released from gases or volatile liquids. If the acutely toxic chemical substance being evaluated is a dust or powder, the same graph procedure can be used assuming that fine dusts or powders behave like vapors in air. The level of concern may need adjustment, however. Solids are often tested for lethality on laboratory animals by administering the substance orally. The results are given as the lethal dose for 50 percent of the test animals or LD_{50} in units of milligrams per kilogram (mg/kg) of body weight. If the test results already give an IDLH or include an LC value, use the procedures above. If only an LD value is given for an oral test, then it must be converted to an inhalation value for use on the quantity determination graph. The National Research Council has developed a simple method for determining the inhalation level associated with an LD oral dose.[1] Convert the LD oral dose in

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[1] National Research Council, Criteria and Methods for Preparing Emergency Exposure Guidance Level (EEGL) Documents, May 1985.

D-5

Errata: page D-5 Formula should read:

LD oral (in mg/kg) x 0.1 = Inhalation IDLH (in g/m^3)

milligrams per kilogram (mg/kg) to inhalation in grams per cubic meter (g/m^3) as follows:

LD oral (in mg/kg) x 213 = Inhalation (in g/m^3)

It must be emphasized that this conversion from oral to inhalation is provided for assessment purposes only when inhalation toxicity values are unavailable. It is not based on a validated technical procedure or any Federal regulation in effect or contemplated and should not be used for any other purpose.

D.4 NEXT STEPS

Once the quantity of concern has been determined from the graph, compare it to the quantity stored in any one container or the quantity that could possibly be released from a process on the site. If the quantity on the site is much higher than the quantity determined from the graph, the work group should continue gathering information for contingency planning for this chemical and site. If the quantity on site is less than the quantity determined from the graph, the work group may want to defer the chemical and the site from the initial contingency planning effort. Depending on the kinds of operations involving acutely toxic chemicals, the structure of the surrounding population, terrain, and meteorology, as well as other factors, the work group may choose to proceed with planning efforts for situations which have not been prioritized by this methodology. **The criteria for selecting sites for contingency planning should not be based on this methodology alone, but should include considerations of all the above factors.**

Figure D-1
GRAPH FOR QUANTITY DETERMINATION

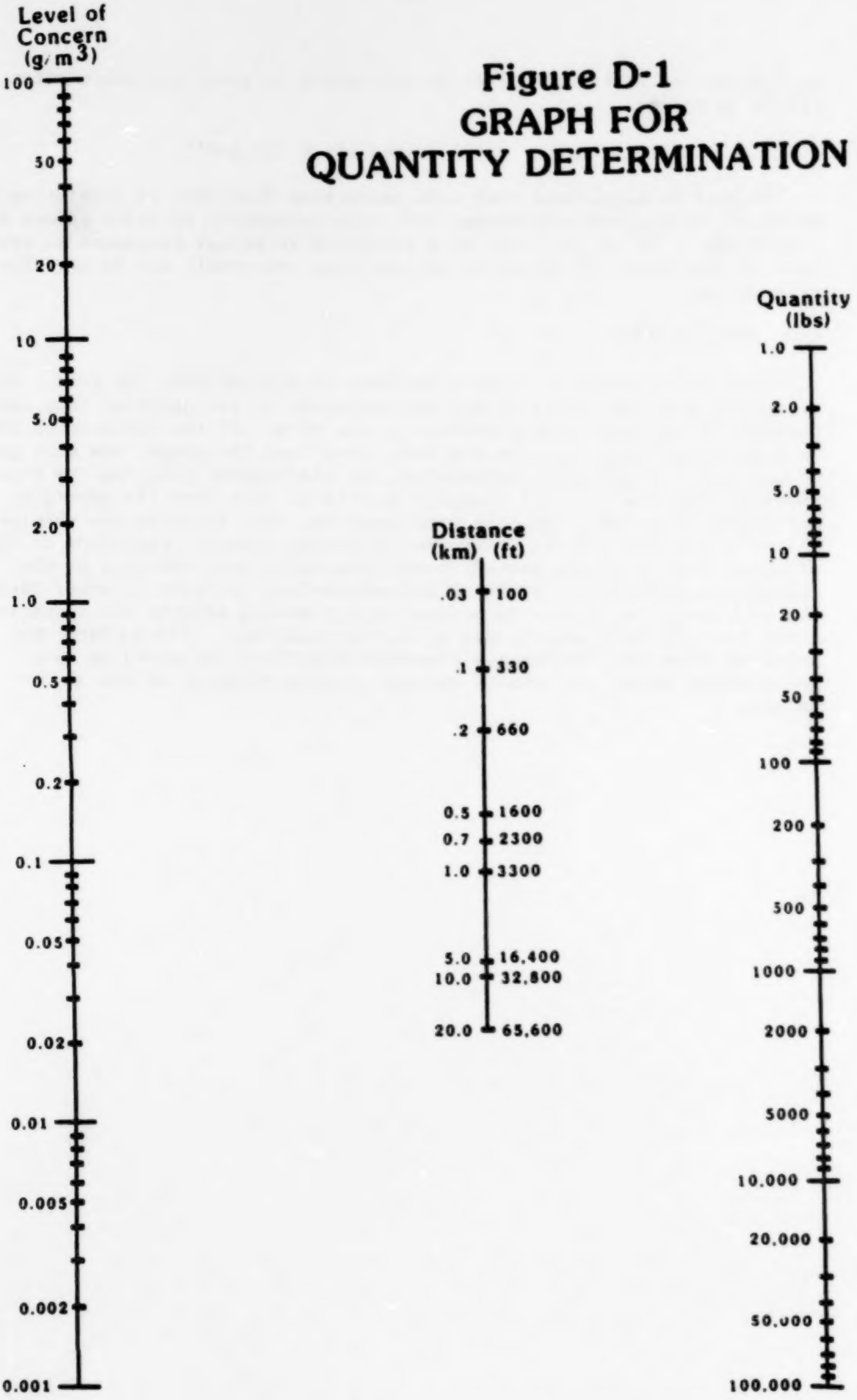
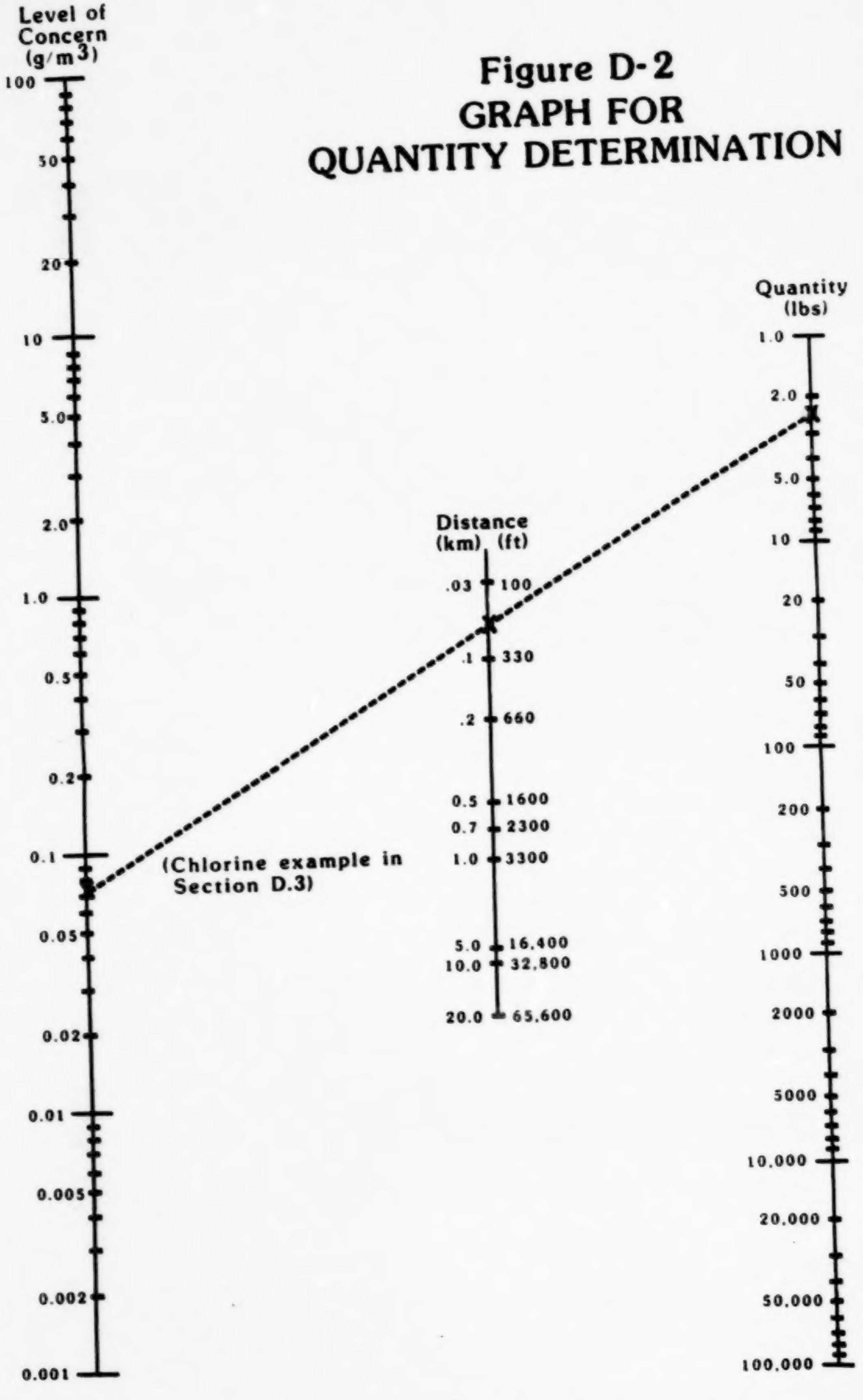


Figure D-2
GRAPH FOR QUANTITY DETERMINATION



APPENDIX E

SELECTED BIBLIOGRAPHY

Chapter 1 referred to other documents that may prove helpful to anyone undertaking to organize a community awareness and preparedness program relating to acutely toxic chemical substances. Several pertinent documents are listed here.

1. Planning Guide and Checklist for Hazardous Materials Contingency Plans. Washington, D.C.: Federal Emergency Management Agency and U.S. Environmental Protection Agency; Prepared by Rockwell International, 1981. (This document is popularly referred to as FEMA-10.)

FEMA-10 is addressed to civic officials and is written in an informal style. The emphasis is on the planning process, rather than on technical details. There are four major sections: (a) awareness (which helps one decide whether a plan is needed); (b) the planning process itself (which helps identify who the planners should be and how the process should work); (c) plan development and content (which identifies the types of plans as well as what they may contain); and (d) plan appraisal and continued planning (which helps evaluate a plan).

We encourage anyone using this guidance to consult FEMA-10 frequently. Helpful references can be found interspersed throughout the text of FEMA-10. Copies of FEMA-10 may be obtained by writing to:

Federal Emergency Management Agency
P.O. Box 8181
Washington, D.C. 20024

Note: FEMA-10 has been widely distributed; approximately 55,000 copies have been provided to Federal, State, local and private hazardous materials planners. Only limited copies of FEMA-10 remain available and re-printing is not currently contemplated since the revised version is scheduled to be available early in 1986. Due to the widespread distribution and the limited copies remaining, please check local availability before requesting a copy. If supplies are exhausted, your request will be added to the waiting list for the revised guidance, which you will receive as soon as it is available.

2. Community Teamwork: Working Together to Promote Hazardous Materials Transportation Safety. Washington, D.C.: U.S. Department of Transportation, Research and Special Programs Administration; Prepared by Cambridge Systematics, Inc. 1983.

This publication provides State and local (i.e., fire, police, emergency service/civil defense, transportation, public safety, and environmental protection) officials with guidance on the most efficient use of their resources to develop effective hazardous materials programs. The bulk of the guide describes how one can, with a limited budget: (1) perform a risk analysis; (2) obtain and mobilize emergency response services; (3) perform hazardous materials inspections; and (4) obtain hazardous materials training.

This guidance document will augment DOT's Community Teamwork by giving major attention to fixed facilities that might be the source of acutely hazardous chemical releases. However, this document does not develop transportation issues in detail; communities can consult Community Teamwork for such considerations.

It is worthy of note that deliberate and detailed attention to minimizing costs is a consistent aspect of DOT's Community Teamwork. Because most communities must plan against the background of strict budget limitations, Community Teamwork should be of interest for this reason alone. Community Teamwork will also prove helpful to those planning to provide personnel safety equipment and clothing. Copies of Community Teamwork can be obtained by calling (202) 426-2301 or writing to:

Office of Hazardous Materials Transportation,
Attn.: DHM-50
Research and Special Programs Administration
Department of Transportation
400 7th Street, S.W.
Washington, D.C. 20590

3. Hazardous Materials Management System: A Guide for Local Emergency Managers. Portland: Multnomah County Office of Emergency Management, 1983.

This handbook is a detailed guidance document prepared at the local level and published by the Multnomah County Office of Emergency Management in Portland, Oregon. This handbook guides the local emergency manager in the development and implementation of a comprehensive system approach for dealing with hazardous materials incidents within a specific geographic area. It is written from the perspective that such a system is multi-disciplinary and requires a team effort under the leadership of a local "emergency manager."

Information on availability of the Multnomah County guide can be obtained by calling (503) 255-3600 or writing to:

Multnomah County Emergency Management
12240 N.E. Glizan
Portland, Oregon 97230

4. Community Awareness and Emergency Response Program Handbook. Washington, D.C.: Chemical Manufacturers Association, 1985.

This recent private sector planning document is similar to those prepared by government agencies. However, the CMA document addresses chemical plant managers in two areas:

- Community awareness: developing a community outreach program and providing the public with information on chemicals manufactured or used at local chemical plants; and
- Emergency response planning: combining chemical plant emergency plans with other local planning.

Like FEMA-10, this CMA document presumes that the key organizing person might have no experience in contingency planning; hence, there is a quantity of elementary detail to help such an organizer. Pages 16-40 will prove helpful to any community preparing to develop a contingency plan to respond to acutely toxic chemical incidents. Appendix 1 lists typical components of a chemical plant emergency response plan; Appendix 2 provides highlights of interrelated plant, community, and State plans.

Copies of the CMA guide are available for a charge of $10.00 and can be obtained by calling (202) 887-1100 or writing to:

Chemical Manufacturers Association
2501 M Street, N.W.
Washington, D.C. 20037

5. An Unconstrained Overview of the Critical Elements in a Model State System for Emergency Responses to Radiological Transportation Incidents. Washington, D.C.: U.S. Nuclear Regulatory Commission and U.S. Environmental Protection Agency; Prepared by Rockwell International, 1981.

6. Atmospheric Emergencies: Existing Capabilities and Future Needs. Washington, D.C.: Transportation Research Board, 1983.

7. Chemical Hazards Response Information System (CHRIS), Manual II: Hazardous Chemical Data. Washington, D.C.: United States Coast Guard, Department of Transportation, 1984.

8. Criteria and Methods for Preparing Emergency Exposure Guidance Level (EEGL) Documents. Washington, D.C.: National Research Council, May 1985.

9. Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants. Washington, D.C.: U.S. Nuclear Regulatory Commission and Federal Emergency Management Agency, 1980.

10. Emergency Planning, Student Manual. Washington, D.C.; Federal Emergency Management Agency, August 1983.

11. Disaster Operations: A Handbook for Local Governments, Washington, D.C.: Federal Emergency Management Agency, 1981.

12. 1984 Emergency Response Guidebook. Washington, D.C.: U.S. Department of Transportation, 1984. This is available at:

Office of Hazardous Materials Transportation,
Attn.: DHM-50
Research and Special Programs Administration
Department of Transportation
400 7th Street, S.W.
Washington, D.C. 20590

13. Guidance for Developing State and Local Radiological Emergency Response Plans and Preparedness for Transportation Accidents. Washington, D.C.: Federal Emergency Management Agency, 1983.

14. Guide and Checklist for the Development and Evaluation of State and Local Government Radiological Emergency Response Plans in Support of Fixed Nuclear Facilities. Washington, D.C.: U.S. Nuclear Regulatory Commission, Office of International and State Programs, 1974.

15. Local Government Emergency Planning, CPG 1-8. Washington, D.C.; Federal Emergency Management Agency, April 1982.

16. Multi-Media Compliance Inspection: Union Carbide Corporation, Institute, WV. Philadelphia: Environmental Protection Agency, Region III, 1985.

17. The National Oil and Hazardous Substances Pollution Contingency Plan. Washington, D.C.: U.S. Environmental Protection Agency, 40 CFR Part 300. (Usually referred to as the National Contingency Plan.)

18. Objectives for Local Emergency Management. Washington, D.C.: Federal Emergency Management Agency, 1984.

19. Risk Assessment/Vulnerability Users Manual for Small Communities and Rural Areas. Washington, D.C.: U.S. Department of Transportation, Research and Special Programs Administration; Prepared by Department of Civil Engineering, Kansas State University, 1981.

20. Student, Patrick J. (ed). Emergency Handling of Hazardous Materials in Surface Transportation. Washington, D.C.: Association of American Railroads, Bureau of Explosives, 1981.

21. Vincent, James R. Overview of Environmental Pollution in the Kanawha Valley. Denver: EPA Office of Enforcement and Compliance Monitoring, 1984.

22. Zajic, J.E., and Himmelman, N.A. Highly Hazardous Materials Spills and Emergency Planning. New York: Marcel Dekker, Inc., 1978.

23. Hazardous Materials Transportation: A Synthesis of Lessons Learned from the DOT Demonstration Projects, Washington, D.C.: ICF Incorporated. This forthcoming report summarizes seven DOT sponsored demonstration projects on prevention and preparedness planning. The synthesis contains a discussion of the lesions learned so that other communities can benefit from the experience (see Appendix F).

APPENDIX F

SUMMARY OF U.S. DEPARTMENT OF TRANSPORTATION CONTINGENCY PLANNING DEMONSTRATIONS

This appendix summarizes the experiences and lessons learned by local, regional, and State governments that participated in hazardous materials transportation safety contingency planning demonstration projects sponsored by the U.S. Department of Transportation (DOT). Detailed information on these projects can be found in the reports prepared by the projects for DOT, which are noted in this guide's bibliography, and the forthcoming summary prepared for DOT, "Accident Prevention and Response Planning for Hazardous Materials Transportation: Lessons Learned from State and Local Experiences" (working title).

The DOT demonstration projects are oriented toward slightly different safety issues than this volume, but communities developing contingency plans for responding to incidents involving the release of acutely toxic chemicals can benefit from the experiences of these related projects. Differences in emphasis between the DOT projects and this volume include the following:

- The DOT projects were primarily concerned with accidents involving transportation rather than sites or facilities;
- The DOT projects gave more emphasis to prevention activities than the current volume; and
- The DOT projects addressed all hazardous materials rather than focusing on acutely toxic chemicals.

Communities engaged in contingency planning for acutely toxic chemicals incidents can benefit in two ways by learning about the experiences of the DOT projects: many of the same activities must be undertaken for both types of contingency planning, and communities may wish to integrate their planning for responding to acutely toxic chemicals incidents with a broader planning effort covering prevention, transportation, and other hazardous materials. After providing some background information on the projects, this appendix briefly summarizes the experiences and lessons of the DOT projects in performing the tasks of contingency planning:

- Getting started;
- Surveying hazardous materials transportation and conducting risk analysis;
- Assessing incident prevention and response capabilities;
- Developing hazardous materials contingency plans; and
- Implementing and updating hazardous materials contingency plans.

Background of the Projects

In 1980, DOT supported a pilot project in the Puget Sound region in the State of Washington to assist the region in developing a contingency plan for improving hazardous materials transportation safety. Following the success of the pilot project, six demonstration projects were supported between 1981 and 1983. The six demonstration projects were in Memphis, Tennessee; New Orleans, Louisiana; Indianapolis, Indiana; Niagara County, New York; Massachusetts; and ABAG (the Association of Bay Area Governments in the San Francisco Bay area of California). Demonstration projects were selected by DOT to represent a variety of geographical settings, transportation hazards, and size and type of area covered by the study. While all the projects addressed the same broad class of hazardous materials transportation problems and carried out the same broad categories of activities, differences in local circumstances led to significant variations in how the planning was undertaken.

Getting Started

To get started in hazardous materials safety planning, it was necessary for each of the demonstration projects to determine the area covered by the planning effort, who should be involved in the effort and in what capacity, how the effort would be organized, and the level and sources of funding. The DOT projects included city, county, regional, and State level efforts. While all levels of projects were able to improve awareness and stimulate safety efforts, the regional and State projects could not implement specific accident prevention and response plans because primary responsibility for these activities is vested in local and county government. Regional and State projects did prove valuable in improving awareness of the hazardous materials problems, fostering enhanced communications and cooperation among local and county governments, and helping local and county governments understand the resources and hazards of their neighbors.

Leadership was vested in a number of different agencies in the projects. For example, the New Orleans project was led by the Environmental Affairs Unit of the Office of Analysis and Planning in the Mayor's office, and other projects were led by the local fire department or emergency management agency; the two regional projects were led by councils of governments. Strong political support proved helpful in some projects, but a change in administration caused delays in implementing plans in one project.

All the projects formed advisory bodies with representatives from affected constituencies: city, county, State, and Federal agencies; city and State legislatures; private industry; and citizens' groups. Regular meetings of the advisory bodies were held, and these meetings were judged by participants to be extremely helpful in improving cooperation and communications among agencies and organizations with sometimes competing interests and views. The advisory bodies operated on a consensus basis and, although the process of achieving consensus required a great deal of time, all projects found the process to be a valuable part of the planning effort. Most of the advisory bodies established committees to deal with specific tasks, and the committees sometimes included additional members with knowledge and interest on the committee's subject area.

The demonstration projects used three approaches for obtaining staff to perform the work:

- Using local agency staff;
- Using local agency staff to manage the project, but relying on contractors or consultants to perform specific portions of the work; and
- Having contractors or consultants perform most of the work.

The staff of the projects that performed most of the work in-house felt their organizations gained institutional knowledge that helped them continue their involvement after the end of the projects; the staff of projects using contractors noted that they lacked in-house expertise in some areas and that it was impractical to hire new staff to perform these duties. Because planning for incidents involving acutely toxic chemicals may require more technical expertise than general hazardous materials contingency planning, there may be more need to obtain outside assistance in developing a specialized contingency plan for such substances.

Costs were kept down in the demonstration projects in a variety of ways, for instance, by utilizing:

- Voluntary assistance;
- Existing surveys and analyses;
- Student interns;
- Industry response resources; and
- Coordinated purchases with nearby communities.

Surveying Hazardous Materials Transportation and Performing Hazards Analysis

The first substantive step in improving hazardous materials safety management for each of the demonstration projects was to get some feel for the hazardous materials problem in the area. The DOT projects found that excellent data were available for all modes of transport (rail, air, water, and pipeline) except for highways. Because most of the projects found that highways pose the greatest hazardous materials transportation risks, some original research on highway hazards was conducted. Methods used ranged from simple counts of placarded trucks to comprehensive surveys of drivers and trucking company officials. Simple counts cannot be used to identify carriers of acutely toxic chemicals, however, because the placarding system does not easily distinguish such chemicals from other hazardous materials. All of the projects found that petrochemicals represent the most common class of hazardous material transported.

After surveying the hazardous materials transportation in their area, the demonstration projects performed a hazards analysis to determine the threats to life, property, and the environment likely to result from the presence of hazardous materials in the area. The risk analyses performed by the DOT projects varied significantly in their sophistication, ranging from qualitative studies that identified the areas most vulnerable to serious incidents to complex computer models that assigned numerical risk ratings to every area in the jurisdiction. Some of the jurisdictions using complex models found them to be costly and difficult to perform. Projects using simpler models were generally satisfied that their simple, less expensive techniques enabled them to identify their most vulnerable areas and improve their response capabilities.

It is important to note that some of the simpler forms of hazards analysis may lead to overlooking the threats posed by acutely toxic chemicals if they concentrate on the most prevalent hazardous materials. The risk posed by an acutely toxic chemicals is caused less by the frequency of incidents than by the potentially large loss of life that can result from a single catastrophic incident.

Assessing Prevention and Response Capabilities

The next step in the planning process performed by the DOT projects was to determine what prevention and response capabilities were available. Each project performed research on laws pertaining to hazardous materials safety at the Federal, State, and local levels. In the transportation area, States paid special attention to the presence or need for a law similar to the Federal-level 49 CFR, which sets requirements, such as placarding requirements and shipping container specifications, for hazardous materials shippers and carriers.

In the area of response capabilities, several of the demonstration projects had findings that could help guide other projects:

- Formal written mutual aid agreements can be useful, but they often lacked detail;
- Communications links generally needed to be improved;
- First responders frequently lacked the specialized training needed for hazardous materials incidents;
- The fire department virtually always had the lead role in response;
- Private industry can play a major role in responding to incidents; and
- Simulations can be useful in identifying weaknesses in response capabilities.

Some of these findings are likely to be highly relevant for developing response plans for incidents involving acutely toxic chemicals. For example, because these chemicals are not as common as other hazardous materials, facilities with such chemicals on-site are likely to have the best equipment and information needed for response. In addition, because major releases of such chemicals occur rarely, simulations may provide the best opportunities for checking response plan adequacy.

Developing Hazardous Materials Contingency Plans

The next step in the planning process for the DOT projects was the development of a contingency plan. As noted above, the plan was adopted on a consensus basis by the advisory body after lengthy discussion by all affected parties.

Although there are many other elements that a plan can contain, the operational contingency plans developed by the DOT projects included:

- A response checklist and communications roster;
- Designation of agency roles and responsibilities; and
- Emergency operating procedures.

In addition to formal approval by the advisory board, many of the projects sought adoption by the jurisdiction's law-making body to give it official status. Additional legislative action was sometimes necessary, for example, where the plan called for specific new laws, such as a "Good Samaritan" law, or where expenditures for training or equipment are required.

Implementing and Updating Hazardous Materials Safety Programs

The DOT projects all recognized that developing a contingency plan is not the end of the process. Several of the jurisdictions have updated their plans as a result of tabletop or field simulations or after incidents indicated shortcomings in the plans. Several of the projects continued their advisory bodies after the formal demonstration projects ended; these jurisdictions noted that even the best of plans can become obsolete over time as hazards change and equipment becomes obsolete. Continued momentum for improving contingency plans occurred most often in projects where the advisory body continued to meet regularly.

APPENDIX G

EPA REGIONAL CONTACTS FOR THE CHEMICAL EMERGENCY PREPAREDNESS PROGRAM

EPA Regional Contacts:

1.	John F. Kennedy Federal Building Room 2203 Boston, MA 02203 (Maine, Vermont, New Hampshire, Massachusetts, Rhode Island, Connecticut)	Environmental Services Division (617) 861-6700, ext. 221
2.	26 Federal Plaza Room 900 New York, NY 10278 (New York, New Jersey, Puerto Rico, Virgin Islands)	Superfund Technical Information Services New Jersey: 1-800-346-5009 New York : 1-800-732-1223
3.	841 Chestnut Street Philadelphia, PA 19107 (Pennsylvania, Maryland, D.C., Delaware, Virginia, West Virginia)	Office of Public Affairs 1-800-438-2474
4.	345 Courtland Street, N.E. Atlanta, GA 30365 (North Carolina, South Carolina, Georgia, Florida, Mississippi, Alabama, Tennessee, Kentucky)	Emergency Response and Control Section (404) 881-3931
5.	230 South Dearborn Street Chicago, IL 60604 (Wisconsin, Illinois, Indiana, Michigan, Ohio, Minnesota)	Jack Barnette Emergency Response Section (312) 886-1964
6.	1201 Elm Street Dallas, TX 75270 (New Mexico, Texas, Oklahoma, Louisiana, Arkansas)	Regional Information Center (214) 767-7341
7.	726 Minnesota Avenue Kansas City, KS 66101 (Nebraska, Kansas, Iowa, Missouri)	Emergency Planning and Response Branch (913) 236-3888
8.	One Denver Place 999 18th Street Suite 1300 Denver, CO 80202 (Montana, Wyoming, Utah, Colorado, North Dakota, South Dakota)	Dewitt Baulch Air Toxic Division, Air Programs Branch (303) 298-1761

9.	215 Fremont Street San Francisco, CA 94105 (California, Nevada, Arizona, Hawaii, American Samoa, Guam)	Chemical Emergency Preparedness Program 1-800-231-3075
10.	1200 Sixth Avenue Seattle, WA 98101 (Washington, Oregon, Idaho, Alaska)	Hazardous Waste Division Emergency Response Team (206) 442-1263

Chemical Emergency Preparedness Program **HOTLINE NUMBER**

1-800-535-0202 (in Washington, D.C.: 535-0202)

(Available for one year, Monday-Friday, 8:30 a.m.-4:30 p.m.)

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